



AUSTRALIAN ACADEMY OF SCIENCE **2021 ANNUAL REPORT**



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This report is available at science.org.au/annual-and-financial-reports

Cover design: The Academy has evolved since a period of disruption that began with hailstorm damage to our heritage-listed Canberra headquarters in early 2020 and continued with the COVID-19 pandemic. 2021 was a year of re-emergence as we repaired the Shine Dome and Ian Potter House, strengthened our influential voice and continued to support and celebrate science in new ways. The butterfly emerging from the chrysalis represents 2021 for the Academy.

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MESSAGE FROM THE PRESIDENT

It is with great pleasure that I present the 2021 Annual Report for the Academy. My term as President comes to an end in May 2022, prompting me to reflect on the ever-important and evolving role of the organisation.

Every major issue affecting our society today relies on scientific input. The pandemic response is the obvious example—but consider also Australia's national security and the role science will play as the AUKUS agreement takes shape; and the role science will have in finding ways to reduce our carbon footprint and mitigate and adapt to more frequent and intense weather events such as floods and fire that challenge our nation.

We are a community that promotes international and national engagement in science, and we are an increasingly prominent voice for Australian science. The 2021 Annual Report demonstrates this through the Academy's diverse accomplishments set out in the following pages.

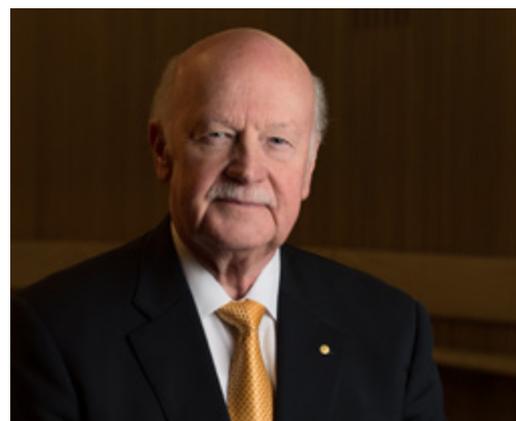
As with 2020, the COVID-19 pandemic was a backdrop to the Academy's work. This included continuing to provide expert advice for responding to COVID-19 and up-to-date resources for a range of stakeholders. Virtual events and online ways of working were balanced with in-person activities when possible. The Academy's flagship event, Science at the Shine Dome, was held as a series of online events throughout the year, enabling a broad audience from all over Australia and internationally. It was a pleasure to welcome 22 new Fellows to the Academy and to share their outstanding research with the broader community. We also celebrated the well-deserved recipients of our awards, grants and conference funding, which you can read more about in this annual report. I sincerely thank our supporters and donors who enabled these activities and ensured the Academy could support science and scientists in 2021.

I also extend a warm thank you to our Fellows for their contributions to and leadership of the Academy. I would like to acknowledge the Council and Executive Committee members whose period of service finished in May 2021, particularly Professor David Day as Secretary Science Policy and Professor Michael Barber as Treasurer. We welcomed Professor Ian Chubb and Professor Marilyn Anderson respectively into these Executive Committee roles.

In November, Academy Fellow Professor Eddie Holmes received the Prime Minister's Prize for Science for his outstanding contributions to virology, not in the least his impacts on our understanding of COVID-19. Congratulations to Professor Holmes for this award and for his tireless commitment to research during the pandemic, and to all our Fellows who received external awards and honours. I would also like to recognise the Academy's Chief Executive, Anna- Maria Arabia, who was awarded Italy's highest civilian honour, the Knight of the Order of the Star of Italy, for strengthening ties between Australia and Italy through the STEM sector.

Finally, thank you to the Academy Fellows for supporting me as your President since 2018. As I pass the baton on, I wish Professor Chennupati Jagadish the best in his tenure as President. Professor Jagadish will ensure the Academy's continued success as he leads a reinigorated strategic direction for the organisation.

Professor John Shine AC PresAA FAHMS(Hon) FRS



CHIEF EXECUTIVE'S MESSAGE

The 2021 Annual Report outlines how the Australian Academy of Science continues to demonstrate the value of the work and contributions made by the outstanding scientists who comprise the Fellowship.

I extend a special thanks to Fellows who contributed their time and expertise to assist the Academy continue our response to both the COVID-19 pandemic and our efforts to move to a more sustainable way of life. A range of resources for multiple audiences, from policymakers to members of the community, are collated at our climate change and COVID-19 hubs on the Academy website.

Our work to support diversity in science has continued with the Academy-created STEM Women platform expanding to 30 countries as part of the STEM Women Asia initiative we led with our international collaborators. This and other efforts have seen the Academy recognised internationally as a leading learned academy for its diversity actions and impact. 2021 demonstrated that not all that is bad harms us. Emerging from the 2020 hailstorm, the Shine Dome is sporting a new copper roof and superior energy efficiency, taking us steps closer to our goal of net-zero emissions for the iconic building.

The resurfaced Shine Dome also saw the launch of the Celebrate Science fundraising campaign where Fellows have been able to dedicate a copper tile to an Australian scientist to celebrate their contribution to science. My deepest gratitude goes to all our generous donors for your support of science, our Fellowship and the home of Australian science. The campaign continues and we encourage your ongoing support so that we can metaphorically cloak the entire Dome and recognise scientific excellence across our nation.

I have only touched on a few of the outcomes of 2021, but this annual report provides many more demonstrations of how the Academy strives to have science valued and strategically positioned to drive our economy, and inform decision-making in and between government, in our parliaments, our courts, our classrooms, in boardrooms and in the public square.

The work of the Academy continues to be an immense source of pride for me, made possible by the guidance and support of our Fellows and the generosity of our donors. I also wish to recognise Academy staff who demonstrate professionalism and commitment daily and who are unified and driven by the goal to advance science in Australia.

I hope you enjoy reading the 2021 Annual Report.

Anna-Maria Arabia
Chief Executive



STRATEGIC PLAN 2018–2022



OBJECTIVES

- | | | | | |
|--|--|--|--|---|
| <p>INFLUENTIAL VOICE</p> <p>Be deeply influential in setting Australia's science agenda</p> <p>Be a trusted independent advisor on scientific matters</p> | <p>INTERNATIONAL ENGAGEMENT</p> <p>Be a leader in the international science academy network</p> | <p>SCIENTIFIC LITERACY</p> <p>Deliver innovative education programs at scale and with impact</p> <p>Enable a better-informed public that values science</p> | <p>EXCELLENCE AND DIVERSITY</p> <p>Be a national leader in diversity, equity and inclusion in the science sector</p> <p>Empower the next generation of scientists</p> | <p>OPERATIONAL EXCELLENCE</p> <p>Ensure long-term sustainability and financial viability along with the highest standards of professionalism</p> |
|--|--|--|--|---|

2021 HIGHLIGHTS



This year, on the topic of COVID-19 the Academy:

developed and distributed a new version of our popular booklet, 'The science of immunisation'

created 8 videos, 6 articles and two infographics explaining the science of COVID-19, sharing them widely with Australians and internationally

delivered 5 webinars to encourage international collaboration during COVID-19.

We thank the Australian Government Department of Health and the Department of Industry, Science, Energy and Resources for supporting these activities.

[See our COVID-19 Resources Hub](#)

On climate change science, the Academy:

released a landmark climate change report on the risks to Australia of a 3°C warmer world

created a digital hub featuring all its articles, reports and videos on climate change science and solutions

published 6 media releases, including 3 statements on COP26 and climate change

released a national 10-year strategy for sustainable oceans and coasts.

[See our Climate Change Hub](#)

To advance and celebrate science in Australia and internationally, we:

published a report identifying opportunities to advance data-intensive research in Australia

supported the call for Kathleen Folbigg's pardon and release from prison based on recent strong scientific evidence

launched a Champions of the Decadal Plan program to support the implementation of the 2019 Nourishing Australia: A decadal plan for the science of nutrition by the National Committee for Nutrition

hosted a national RNA roundtable that supported Australia becoming a leader in RNA science and technology

called on the NSW Government to remove all feral horses from Kosciuszko National Park

provided advice and submissions to government inquiries and consultations, including appearing at parliamentary hearings

re-roofed and improved the sustainability of our heritage-listed building, the Shine Dome, following severe hail damage in 2020.



PHOTO BY HENRIQUE FÉLIX ON UNSPLASH

million
impressions
on social media

We supported scientists and encouraged diversity in science by:

recognising 24 leading scientists with honorific awards, and announcing support for more than 40 scientists with grants, fellowships and conference funding

welcoming 22 new Fellows for 2021, the cohort made up of 41% women and 59% men

publishing a report about gender inequity in the STEM workforce across the Asia-Pacific

launching the STEM Women Asia database to raise the profile of women in STEM

hosting the finale of Falling Walls Lab Australia for early career researchers

participating in NAIDOC Week, and shining light on Aboriginal and Torres Strait Islander scientists

joining with Australia's other learned academies to respond to the Uluru Statement from the Heart.

We brought science to a broad audience by:

recording more than 18 million impressions on social media

welcoming more than 4.4 million visitors to our websites

publishing over 70 videos, many of which were embedded in online mainstream media stories 615 times, and articles that were mentioned or quoted 122 times (across all media syndications)

delivering 37 online and hybrid events for audiences across Australia and around the world, including the Academy's annual flagship event 'Science at the Shine Dome'

holding 'scienceXart', a photo competition about food and nutrition for school students across Australia.

THE FELLOWSHIP

The Australian Academy of Science is a Fellowship of the nation's most distinguished scientists, elected by their peers for ground-breaking research and contributions that have clear impact.

2021 Fellows



Professor Steven Chown FAA
Antarctic ecologist
Monash University



Professor Arthur Christopoulos FAA FAHMS
Molecular pharmacologist
Monash University



Dr Gregory Clark AC FAA FTSE
Non-Executive Director
NextDC (Special Election)



Professor Susan Coppersmith FAA
Condensed matter physicist
University of New South Wales



Professor Brendan Crabb AC FAA FAHMS
Microbiologist
Burnet Institute



Professor Mark Dawson FAA FAHMS
Cancer biologist
Peter MacCallum Cancer Centre



Professor Yihong Du FAA
Mathematician (differential equations)
University of New England



Professor Barry Pogson FAA
Plant biologist
Australian National University



Professor Robin Gasser FAA
Parasitologist
University of Melbourne



Professor Glenda Halliday FAA FAHMS
Neuroscientist
University of Sydney



Professor Rob Hyndman FAA FASSA
Statistician (forecasting)
Monash University



Professor Dorrit Jacob FAA
Geochemist
Australian National University



Professor Catherine Lovelock FAA
Ecologist
University of Queensland



Professor Barbara Nowak FAA
Fish health researcher
University of Tasmania



Professor Andrew Pitman AO FAA
Climatologist
University of New South Wales



Professor Ian Reid FAA FTSE
Computer vision researcher
University of Adelaide



Professor Alison Rodger FAA
Biochemist
Macquarie University



Professor John Sader FAA
Applied mathematician (nanoscale systems)
University of Melbourne



Professor Margaret Sheil AO FAA FTSE
Vice-Chancellor and President
Queensland University of Technology
(Special Election)



Professor Gordon Smyth FAA
Statistician (genomics)
Walter and Eliza Hall Institute
of Medical Research



Professor Svetha Venkatesh FAA FTSE
Computer scientist (machine learning)
Deakin University



Professor Hala Zreiqat AM FAA FTSE FAHMS
Biomedical Engineer
University of Sydney

Fellows at Dec 2021

22 Fellows elected
in 2021

42 prestigious awards and
honours received by Fellows

32 Corresponding
Members at Dec 2021

2 Corresponding
Members admitted

Corresponding members



Emeritus Professor Eleanor Dodson FAA FRS
Computational biologist
University of York, UK



Sir Fraser Stoddart FAA FRS NOBEL LAUREATE
Chemist
Northwestern University, USA

Honours and awards to Fellows

Featured honours



PRIME MINISTER'S PRIZE FOR SCIENCE

Australian virologist, **Professor Eddie Holmes** FAA FRS, received the Prime Minister's Prize for Science in 2021



EUREKA PRIZES

Professor Justin Gooding FAA led the team which was awarded the Eureka Prize for Innovative use of Technology



IUPAC

Professor Martina Stenzel FAA was recognised by the 2021 IUPAC Distinguished Women in Chemistry or Chemical Engineering Award



ROYAL SOCIETY

Professor Marilyn Renfree AO FAA FRS and **Professor David Craik** FAA FRS were elected as Fellows of the Royal Society



NATIONAL ACADEMY OF SCIENCES

Dr Liz Dennis AC FA FTSE and **Professor Lisa Kewley** FAA were elected as International Members of the National Academy of Sciences



TIME100 MOST INFLUENTIAL PEOPLE 2021

Professor Lidia Morawska FAA was announced as one of TIME's Most Influential People in 2021 for her work on COVID-19

More honours and awards

| | |
|---|---|
| Professor Jerry Adams FAA FRS | Fellow of the Australian Academy of Health and Medical Sciences |
| Professor James Angus AO FAA FAHMS | Lieutenant-Governor of Victoria |
| Emeritus Professor Hans Bachor AM FAA | Cross of the Order of Merit of the Federal Republic of Germany |
| Scientia Professor Richard Bryant AC FAA FAHMS FASSA | Leadership in Innovation in NSW, Premier's Prizes for Science & Engineering |
| Professor Steven Chown FAA | Medal of the 30th anniversary of the Madrid Protocol on the Protection of the Antarctic Environment |
| Professor Suzanne Cory AC FAA FRS | Fellow of the Australian Academy of Health and Medical Sciences |
| Dr Noel Cressie FAA | elected a Fellow of the Royal Society of New South Wales |
| Dr Liz Dennis AC FA FTSE | International Member of the National Academy of Sciences |
| Professor Graham Goodwin AO FAA FRS FTSE | Order of Australia: Officer in the General Division |
| Professor Martin Green AM FAA FTSE FRS | Japan Prize |
| Dr TJ Higgins AO FAA FTSE | Crawford Fund Medal |
| Professor Richard Hobbs FAA | 2021 inductee into the Western Australian Science Hall of Fame |
| Professor Rob J Hyndman FAA FASSA | Pitman Medal |
| Professor Chennupati Jagadish AC FAA FTSE | Foreign Fellow of the National Academy of Sciences of India |
| Professor Lisa Kewley FAA | International Member of the National Academy of Sciences |
| Professor Sharad Kumar AM FAA FAHMS | South Australian Scientist of the Year |
| Professor Evans Lagudah AO FAA | Officer of the Order of Australia for distinguished service to agriculture and food science as a researcher in the area of wheat genetics. |
| Emeritus Professor Kurt Lambeck AC FAA FRS | Companion of the Order of Australia for eminent service to science, particularly to geophysics and geodesy, through research roles at the national and international level, to professional scientific organisations, and to education. |
| Professor Helene Marsh AO FAA FTSE | Order of Australia: Officer in the General Division |
| Distinguished Professor Ivan Marusic FAA FTSE | Elected a Fellow of the Australian Academy of Technology and Engineering |
| Dr Ken McCracken AO FAA FTSE | COSPAR Space Science Award |
| Dr Graeme Moad FAA FTSE | Elected a Fellow of the Australian Academy of Technology and Engineering |
| Professor Suzanne O'Reilly AM FAA | A new rare mineral, oreillyite (Cr ₂ N), has been named in her honour by the International Mineralogical Association. |
| Emeritus Professor Cheryl Praeger AC FAA | Order of Australia: Companion in the General Division |
| Emeritus Professor Stephen Powles FAA FTSE | Seed of Gold Award, Grains Research and Development Corporation |
| Professor Mark Randolph AO FAA FTSE FRS | Order of Australia: Officer in the General Division |
| Professor Colin Raston AO FAA | South Australian Scientist of the Year |
| Professor Roger Reddel AO FAA FAHMS | Order of Australia: Officer in the General Division |
| Dr Steve Rintoul AO FAA | Officer of the Order of Australia for distinguished service to climate science through oceanographic and Antarctic research and policy development. |
| Professor Halina Rubinsztein-Dunlop AO FAA | 2020 Harrie Massey Medal, Australian Institute of Physics |
| Scientia Professor Veena Sahajwalla FAA FTSE | 2022 NSW Australian of the Year |
| Professor Malcolm Sambridge FAA | 2021 Beno Gutenberg Medal, European Geosciences Union |
| Professor Rod Tucker OAM FAA FTSE | IEEE Photonics Award |
| Professor Mathai Varghese FAA | 2021 George Szekeres Medal, Australian Mathematical Society |
| Professor Toby Walsh FAA | Elected a Fellow of the Association for Computing Machinery |
| Professor Ole Warnaar FAA | George Szekeres Medal, Australian Mathematical Society |
| Emeritus Professor Jim Williams AO FAA FTSE (ANU) | Officer of the Order of Australia for distinguished service to the physical sciences, to tertiary education, and to professional scientific organisations. |

Fellows' involvement in the Academy

Academy-related activities in which Fellows were involved included:

Policy submissions and reports • National Committees for Science • international meetings and collaborations • awards committees • sectional committees for assessing candidates nominated for Fellowship • media participation • video and article reviewers and expert interviewees • symposium and online event convenors and expert participants • organisational governance • regional groups • fundraising and partnerships

All involvement by Fellows in the Academy is in a voluntary capacity.

Deceased Fellows and Corresponding Members

Professor Olle Erik Björkman FAA NAS
29 July 1933 to 24 November 2021

Professor Amyand David Buckingham CBE FAA FRS NAS
28 January 1930 to 4 February 2021

Professor Emeritus Anthony (Tony) George Klein AM FAA
14 December 1935 to 18 November 2021

Professor Jeremy Pickett-Heaps FAA FRS
5 June 1940 to 11 April 2021

Professor Derek Robinson DPhil FAA FAustMS
26 May 1935 to 31 August 2021

Professor George Rogers AO FAA
27 October 1927 to 3 November 2021

Professor Roger Short AM ScD Hon DSc (Bristol Edin Guelph)
Hon FRCOG FAA FRANZCOG FRCVS FRS FRSE
31 July 1930 to 6 August 2021

Professor John Charles Howorth Spence FAA ForMemRS
21 April 1946 to 28 June 2021

Emeritus Professor Stuart Ross Taylor AC FAA FRSNZ NAS
26 November 1925 to 23 May 2021

Dr Roy Woodall AO FAA FTSE
3 November 1930 to 14 February 2021

Historical archives

The archives of the Australian Academy of Science hold a rich and varied collection of unpublished and primary source material documenting the history of science in Australia. Over its 60-year history, the collection has evolved into a substantial resource providing a rare and valuable window into Australian scientific discovery in the nineteenth and twentieth centuries.

During 2021, the Academy received 25 research requests from internal and external clients, including local, interstate, and international scholars from as far away as London, Washington DC, Beijing and Christchurch. Materials accessed were drawn from personal archives of Academy Fellows and records of Australian scientific societies, Academy operational records, and collections of architectural information about the Shine Dome and Ian Potter House.

The Academy supports and encourages the use of its archives by making a searchable catalogue available to the public, with content available for examination where it has been digitised. [Search Academy Collections](#)

Conversations with Australian Scientists

In 2021, the Academy's Council reinstated its Conversations with Australian Scientists, using donations from Fellows and guided by a working group of Fellows. The project recognises the significant contributions to research and public life made by Academy Fellows and other leading Australian scientists, and the role of oral history in preserving and understanding the ongoing story of Australian science. Equipment was purchased to enable high-quality remote and in-person audio recording, and three conversations were conducted in 2021 with participants who volunteered to thoroughly test hardware, software, and documentation processes.

Professor Hans Bachor AM FAA

Dr TJ Higgins AO FAA FTSE

Professor Robin Batterham AO FAA FTSE

Community Heritage Grant

The Community Heritage Grants program run by the National Library of Australia assists in preserving locally owned but nationally important cultural heritage collections. In 2021, a grant from this program supported the Academy to undertake a significance assessment of its manuscript collections.

The assessment by external consultant Dr Roslyn Russell stressed the archives' 'immense research significance', making it 'a natural starting point for any research into Australian science and scientists'. Collections are notable for their historical and social significance as a major repository for records of Fellows of the Academy – leaders in their respective scientific communities. The assessment points to examples of artistic and aesthetic significance, with hand-drawn cartoons, fine graphic design, illustrations, and photography present in many collections; and suggests a high degree of interpretive potential can be found in its numerous stories of scientific discovery.

Archive digitisation

Fundraising to digitise important collections began in 2020, and the Academy continued its progressive and ongoing archive digitisation program in 2021. This project is opening new pathways into the historic collection with the initial aim of preserving the most fragile and significant resources and making them freely available online.

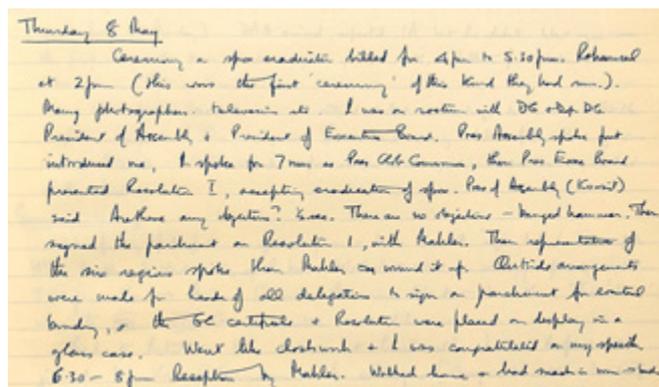
Of particular interest is the manuscript collection of Professor Frank Fenner AC CMG MBE FRS FAA, which received a grant from the UNESCO Memory of the World Committee for Asia and the Pacific and the Asia Culture Center.

Professor Fenner is widely known for his significant role in global public health as Chair of the World Health Organization (WHO) Global Commission for the Certification of Smallpox Eradication, and for his extensive contribution to the understanding of viruses and the literature of microbiology.

The grant enabled the Academy, in collaboration with the National Library of Australia, to digitise and provide digital access to Professor Fenner's diaries documenting work undertaken while travelling internationally between 1948 and 1999.

The digitised notebooks are now freely accessible via Trove Search – Trove (nla.gov.au) and the Academy Collections online catalogue Search – AIS (ais.axiellcollections.cloud/SCIENCE).

The project was guided by the Digitisation Expert Working Group, comprising external experts and Fellows.



The work of Professor Frank Fenner AC CMG MBE FAA FRS and others resulted in the eradication of smallpox. His notes from 8 May included the following: " ... Pres Exec Board presented Resolution 1, accepting eradication of spx. Pres of Assembly (Kuwait) said Are there any objections? ½ sec. There are no objections - banged hammer."

(AAS MS14 3000309 PAGE 104). IMAGES: AUSTRALIAN ACADEMY OF SCIENCE

PHILANTHROPY AND PARTNERSHIPS

INCOME 2021:

\$387,016

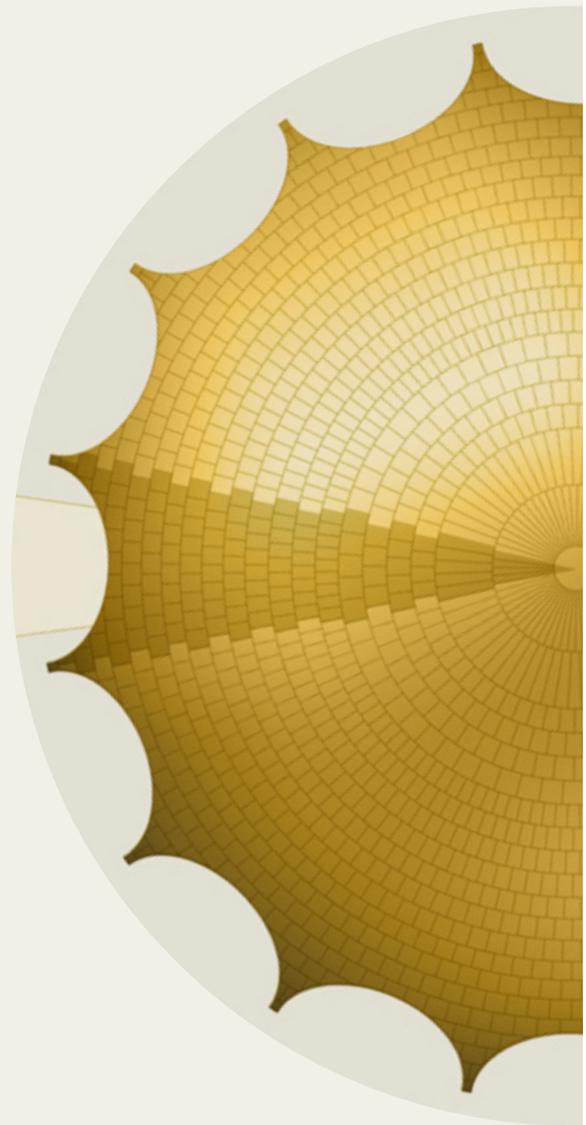
Sponsorship

\$3,032,181

Grants

\$413,817

Donations



Donations and impacts

Many of our core activities such as scientific meetings, advice to support policy development, publications and videos, education, public awareness and outreach, international activities, awards and fellowships would not be possible without the support of donors.

Celebrate Science campaign



In January 2020, Canberra was struck by a severe hailstorm and the Shine Dome was significantly battered, requiring its copper roof to be resurfaced, one tile at a time. Fortunately, insurance covered the cost of the repairs and Council decided to use the re-roofing of the Shine Dome as an opportunity to celebrate Australian science and increase the long-term endowment of the Academy. Restorative works were completed in 2021, with 1888 custom-made copper tiles being installed.

To mark this occasion and to recognise the critical role scientists play, the Academy invited our Fellows to celebrate their Fellowship by dedicating a tile to another Fellow, a Corresponding Member or a deceased Fellow.

During the year, 182 tiles were dedicated, including 5 Nobel Laureates, 12 presidents and 4 founding Fellows. The Celebrate Science campaign will open to the broader community in 2022 and invite people to join the Academy in celebrating science by dedicating a copper tile to an Australian scientist who has made a significant contribution to science.

CELEBRATING A 60 YEAR PHILANTHROPIC PARTNERSHIP WITH THE SELBY FOUNDATION

In 2021 The Academy celebrated a 60-year philanthropic partnership with the Selby Foundation. Together, since 1961, we have supported Fellowships that are awarded to distinguished overseas scientists to visit Australia for public lecture or seminar tours and to visit scientific centres in Australia. Fellows are expected to increase public awareness of the physical and biological sciences and scientific issues and accordingly are outstanding lecturers to the general public.

This partnership reflects the enduring impact of philanthropy supporting the work of the Academy.

THE MAX DAY ENVIRONMENTAL SCIENCE FELLOWSHIP AWARD

The award is named in honour of the late Dr Maxwell Frank Cooper Day AO FAA who spent a lifetime championing entomology, conservation and forestry, as well as helping other scientists. Through sponsoring this award, Dr Day acknowledged the support that he himself received as a young researcher to travel overseas to gain his PhD at Harvard. Following Dr Day's strong belief in the strength of a multi-disciplinary approach to research, only applicants who are able to demonstrate a multi-disciplinary approach to their research are considered for this award.

This award has been made available through generous contributions from the following individuals:

PRESIDENTS' CIRCLE (DONATIONS OF OR VALUED AT \$100,000 – \$499,000)

Dr Maxwell Frank Cooper Day AO FAA

Dr Jon Day PSM

Mr Doug Hooley PSM

SCIENCE CIRCLE (DONATIONS OF OR VALUED AT \$20,000 - \$99,000)

Professor Andrew (Frank) Smith FAA

The full list of donors and more information can be found at the [Academy's website](#).

"I'd like to reiterate how important and special it is for early career researchers to have these opportunities and be able to receive recognition for competitive awards that do strengthen our CVs. As I said in our session, it's my first award and I'm so proud to list that on my CV (after three attempts!)". DR STEPH GARDNER, HIGHLY COMMENDED, MAX DAY AWARD 2021

BEQUESTS

The Academy thanks all those who have created a legacy to science by remembering the Academy in their will. If the time is ever right for you to remember a charity in your will, please remember the Australian Academy of Science.

Every gift—however large or small—is important. Even 1% (so your family inherits 99%) or a modest sum of money makes the world of difference.

Contact our Philanthropy Manager to discuss at isobel.griffin@science.org.au

Acknowledgement of donors

We are deeply grateful to the following individuals and organisations for their extraordinary generosity. Our Academy Pillars have, over time, contributed an outstanding level of support to the Australian Academy of Science.

Academy Pillars

DONATIONS OF OR VALUED AT \$500,000 +

IN PERPETUITY

Sir Jack Ellerton Becker FAA

Estate of Thomas Lewis Davies

Department of Communications,
Information Technology and the Arts

FJ Fenner AC CMG MBE FAA FRS and Mrs Bobbie Fenner

Dr Margaret Middleton

The Royal Society (UK)
Theo Murphy (Australia) Fund

Estate of Ian Gordon Ross AO FAA

Estate of Miss JG Russell

Professor John Shine AC FAA

Telstra Foundation

Professor G W Kenneth Cavill Bequest

The Australian Academy of Science acknowledges the support of donors who gave generously over the past 12 months. Their support plays a critical role in helping the Academy achieve its mission.

President's Circle

DONATIONS OF OR VALUED AT \$100,000 – \$499,999

Professor Michael Barber AO FAA FTSE

Dr Jon Day PSM

The Finkel Foundation

Mr Doug Hooley PSM

Minderoo Foundation

The Ian Potter Foundation

Dr Anna Rickards

Anonymous 2

View [full donor list](#).

Sponsorship

The Academy is open to partnering with organisations that recognise and value the mutual role science plays in industry, and industry plays in science. Successful partnerships with the Academy have real and lasting impacts.

The Academy thanks sponsors that enabled events and programs to occur in 2021, such as the National RNA Roundtable, multiple public lectures, and our seminal annual event, Science at the Shine Dome.

SCIENCE AT THE SHINE DOME EVENT PARTNERS

Australia's annual celebration of science was again made possible with the support of event partners. In 2021, Science at the Shine Dome was presented in a dynamic new online and in-person format. Our partners joined us in the hybrid format series of events. We thank our partners for their support.



INTERNATIONAL PROGRAMS AND COLLABORATION

The Academy facilitates Australia's access to global science and technology, promotes strategic partnerships between Australian and overseas researchers, and contributes Australian expertise and leadership in regional and global science networks.

The ongoing COVID-19 restrictions did not dampen the enthusiasm and interest of the global science community to engage internationally. As a result, a number of meetings, conferences and webinars continued taking place in a virtual setup with international partners and collaborators of the Academy.

The Academy's international programs had a strong focus on supporting early- and mid-career researchers who have been heavily impacted by this pandemic, while senior researchers were involved in several international working groups, contributing their expertise in producing important international statements and attending virtual gatherings to resolve matters of global interest.



Bangladeshi child tasting the complementary food developed by Dr Jessica Bogard, winner of the 2021 APEC ASPIRE prize. PHOTO: WORLD FISH



Falling Walls Lab 2021 winners (left to right): first place Dr Jiao Li, second place Cahmikara Liyanage, third place Dr Lokman Norazmi

2021 highlights – statements and working groups

The Academy:

nominated Professor Hugh Possingham in an InterAcademy Partnership (IAP) working group that put together a statement on the protection of marine environments, that was endorsed by the Academy

endorsed an IAP statement on the ongoing opportunities and challenges in regenerative medicine

reviewed and endorsed Association of Academies and Societies of Sciences in Asia (AASSA) statement on the imperative of climate action to promote and protect health in Asia

nominated Professor Matthew England to be part of an IAP working group tasked with reviewing and adapting a statement on zero carbon emissions, which was endorsed by the Academy

nominated Professor David Lindenmayer to the working group that developed a statement on interlinkages between biodiversity and climate change, led by the Royal Society and endorsed by the Academy

endorsed G20 Science 20 (S20) and Social Science and Humanities 20 (SSH20) joint statements for the G20 heads of state and government

facilitated Professor Peter Doherty to review a statement on pandemic preparedness and the role of science, led by the Accademia dei Lincei in Rome as the host of the S20 meetings

endorsed a G7 statement on data for international health emergencies: governance, operations and skills, created by the Science Academies of the Group of Seven (G7) to realise a better level of 'data readiness' for future health emergencies

endorsed a G7 statement on a net-zero climate-resilient future – science, technology and the solutions for change, created by the G7 nations, on the need for the G7 countries to anticipate the risks associated with climate change, face the transition that this requires, and carefully design, plan and accelerate action to reach net-zero by 2050 or earlier

endorsed G7 statement on reversing biodiversity loss – the case for urgent action by the G7 nations on the magnitude of biodiversity decline and the urgent action required to halt and reverse this trend

endorsed a statement concerning the crisis in Afghanistan in August 2021, produced by the Accademia Nazionale dei Lincei as the host of the S20 academies.

International webinars and meetings

The Academy's Foreign Secretary, Professor Elaine Sadler, attended virtual meetings of the S20 academies in July and September 2021, hosted by the Accademia dei Lincei (Italian Academy). The meeting discussed ways in which academies could help to implement the recommendations of the statement Pandemic preparedness and the role of science.

IAP joint meeting of the Boards of the IAP-Science, IAP Policy, and IAP Health took place as a hybrid event in October, hosted in Rome by the Accademia Nazionale dei Lincei. Professor Sadler attended the meeting virtually. The IAP-Science Executive Committee (2019-2022) met virtually in March.

Working with the Australian Government Department of Education, Skills and Employment (DESE), the Academy delivered the 2021 Australia–Brazil Virtual Research Collaboration (VRC). This activity contributed to achieving the Academy's strategic objective of international science engagement by assisting DESE to deliver the program and foster research collaborations with Brazil. The VRC focused on COVID-19 research and discussed several topics over three days, in two-hour themed sessions in November.

Stream 1: Health system responses and public policies

Stream 2: Medical treatments and therapies

Stream 3: One Health.

Opportunities for scientists

COMMONWEALTH SCIENCE CONFERENCE 2021: SCIENCE FOR A RESILIENT FUTURE

The third Commonwealth Science Conference (CSC) organised by the Royal Society took place virtually in February. The Academy's Foreign Secretary, Professor Elaine Sadler, was a member of the steering committee of this conference and worked closely with the Royal Society on this event. The theme of the conference was 'Science for a resilient future'. The aim of the CSC is to encourage collaboration and activities that promote science across Commonwealth nations.

At the opening ceremony of this event, Professor Sadler interviewed His Excellency, Anote Tong, Former President of Kiribati. Professor Veena Sahajwalla presented her work on waste recycling and manufacturing. Other presenters from Australia included Dr Tayanah O'Donnell (Director, Future Earth Australia), and Professor Peter Doherty.

The Academy nominated 15 young researchers from Australia who attended the event online. Dr Sheryn Pitman from the South Australian Museum and Dr Alison Ciesla from the University of New South Wales spoke at two parallel sessions of the conference, on 'just transition' and 'decarbonising energy systems' respectively.

FALLING WALLS LAB AUSTRALIA

The Academy hosted the sixth Falling Walls Lab Australia, held virtually in September. Australia's Chief Scientist, Dr Cathy Foley, chaired the jury that selected the top three winners of this competition. The nine EMCRs who participated in the Academy Lab were pre-selected in Falling Walls Labs held in New South Wales and hosted by DAAD and EURAXESS, in Victoria, hosted by veski, and in Queensland hosted by the University of Queensland.

The Lab winners were:

First place: Dr Jiao Jiao Li, University of Technology Sydney

Second place: Mr Chamikara Liyanage, Queensland University of Technology

Third place: Mr Lokman Norazmi, University of Tasmania

The People's Choice winner was a tie between Lokman Norazmi and Chamikara Liyanage who were selected by a survey of the audience.

The winners presented their ideas in Berlin to a global audience, online from Australia, as part of a select group of 100 young innovators.

LINDAU NOBEL LAUREATE MEETINGS

The 70th Lindau Nobel Laureates Meeting (Interdisciplinary) took place from 27 June to 2 July 2021, virtually due to the pandemic. All 11 delegates from Australia selected by the Academy to originally attend the 70th Lindau meeting in 2020 joined the virtual 2021 Lindau meeting. The Lindau Council has extended an offer to these 11 young scientists to join the Lindau meeting in person for the next meeting of their respective disciplines (chemistry 2022, physiology or medicine 2023 and physics 2024).

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE (JSPS) FELLOWSHIPS

The Academy nominated 12 Australian EMCRs for the Japan Society for the Promotion of Science (JSPS) fellowships. The JSPS Postdoctoral Fellowship Program for Foreign Researchers provides fellowships for Australian postdoctoral researchers to conduct, under the guidance of their Japanese hosts, cooperative research with leading research groups in universities and other Japanese institutions. The program aims to help such researchers advance their own research while contributing to the advancement of research in Japan and the counterpart countries.

REGIONAL COLLABORATIONS PROGRAMME COVID-19 DIGITAL GRANTS

The Academy awarded 26 Australian researchers with grants of up to A\$10,000 each – totalling \$253,827. The grants were awarded under the Regional Collaborations Programme COVID-19 Digital Grants, funded by the Department of Industry, Science, Energy and Resources to increase connectivity and engagement between Australia and Asia–Pacific economies in response to the COVID-19 pandemic.

ASPIRE PRIZE

Australia's 2021 APEC Aspire Prize nominee, Dr Jessica Bogard from CSIRO, won the prestigious APEC Aspire Prize for 2021. Dr Bogard is a nutrition scientist who developed a product to help address widespread malnutrition among women in Bangladesh. The product is a nutritious fish-based chutney tailor-made for pregnant and lactating women, made from local ingredients and based on traditional recipes.

The prize, valued at US\$25,000, recognises young scientists from Asia–Pacific Economic Cooperation (APEC) member economies who have demonstrated a commitment to excellence in innovation, research and education. Dr Bogard was nominated for the prize by the Academy.

International activities

During the year, the Academy interacted with many countries across the world through its membership of global science organisations such as the InterAcademy Partnership and the Association of Academies and Societies of Sciences in Asia, and also bilaterally, including with the following countries:

- | **Italy** through the S20, the national academies of science of G20 nations
- | **Brazil** through the Australia–Brazil Virtual Research Collaboration event
- | **Germany** through the Falling Walls Lab and Lindau Nobel Laureates Meeting
- | **The UK** through the Commonwealth Science Conference
- | **Japan**, through the Japan Society for the Promotion of Science (JSPS) fellowships.

AWARDS AND FUNDING

The Academy champions, celebrates and supports excellence in Australian science through its awards and grants.

32

award schemes opened and managed in 2021 with 29 associated award selection committees

\$375,537

awarded to 47 recipients

24

Honorary awardees

21

Research awardees

2

Conferences funded

1

Travelling fellowship funded

Honoric awards



Premier honorifics

MATTHEW FLINDERS MEDAL AND LECTURE 2021

Professor Andrew Holmes AC FAA FRS FTSE

Professor Andrew Holmes is recognised for his world-leading contributions to the chemical synthesis of organic and polymeric substances for use at the interface with materials science and biology.

Plastics have traditionally been used as insulators or lightweight structural components. However, as a result of Professor Holmes's contributions in developing plastics that emitted light when sandwiched between electrodes connected to a power source, the world now recognises that these materials can serve as semiconductors for flat screen TVs, for organic solar cells and in transistors.

Professor Holmes led the Victorian Organic Solar Cell Consortium that delivered highly efficient solar cells and showed that they could be printed on plastic.

In the area of cell biology, Professor Holmes's research group collaborated with the Walter and Eliza Hall Institute to attach their synthetic signalling molecules to beads that could be used as fishing lines to identify many key proteins involved in colon cancer cellular signalling.

INAUGURAL RUBY PAYNE-SCOTT MEDAL AND LECTURE 2021

Emeritus Professor Cheryl Praeger AC FAA

Professor Cheryl Praeger's work on the mathematics of symmetry has been in the vanguard of a mathematical revolution caused by the classification of the finite simple groups, the atoms of symmetry from which all finite groups are built. She has elucidated the internal structure of these simple groups, and driven research on applying their immensely powerful classification to study symmetric structures.

Professor Praeger has developed a theory of quasiprimitive groups which, via her innovative 'normal quotient method', established a new paradigm for working with symmetric graphs and exploited the simple group classification.

Professor Praeger demonstrates an extraordinary ability to foster and inspire others, supporting women, advocating for mathematics in schools, and promoting mathematics in emerging economies.



Career honorifics

DAVID CRAIG MEDAL AND LECTURE 2021

Professor Thomas Maschmeyer FAA FTSE

Professor Thomas Maschmeyer's research vision is driven by a strong desire to help address the many urgent physical challenges we face due to climate change and global resource limitations in combination with a growing world population. In this context, he sees catalysis as a key science and technology and has made seminal contributions to catalytic research that have transformed how we design, interrogate (under operating conditions) and use catalysts in (petro) chemical processing as well as photo- and electrocatalysis.

His work has led to fundamental breakthroughs in catalytic materials, in-situ characterisation, green chemistry, hydrothermal processing, ionic liquids and energy materials.

He has translated many of his successes from his laboratory to scale, with his inventions adopted in various industry sectors globally, to enable a circular economy, including (petro) chemical re-processing of (plastic) waste, utilisation of renewable chemicals and energy storage through his emerging battery technology.

HANNAN MEDAL 2021

Professor Mathai Varghese FAA

Professor Mathai Varghese has made highly influential contributions to the field of geometric analysis, which relates geometric, analytic and algebraic properties of (possibly infinite dimensional) manifolds. Among these are his co-inventions of Fractional Index Theory and Projective Index Theory that have received international recognition for explaining the mystery of the analytic counterpart of the A-hat genus. His recent joint work extending the Fractional Index Theorem to infinite dimensional loop spaces is also of immense significance.

His joint body of work proves the conjecture that fundamental quantization commutes with reduction in the noncompact case. Also seminal is his joint work on twisted analytic torsion, where an analogue of the Cheeger-Muller theorem is proved, establishing the equality by using a new combinatorially-defined twisted torsion. A catalyst for much activity in the area is his joint work formulating the magnetic gap-labelling conjecture, which labels the spectral gaps of certain magnetic Schroedinger operators on Euclidean space. Evidence for the validity of the conjecture is given in 2D, 3D and for principal solenoidal tori in all dimensions, which is itself a breakthrough.

JAEGER MEDAL 2021

Professor John Church FAA FTSE

Professor John Church is one of Australia's leading oceanographers whose theoretical and observational work on the dynamics of the oceans has led to a deep understanding of the physics of recent sea-level change, both globally and for the Australia-Pacific region. He has played a leading role in establishing a consistent and robust record of sea level change integrating the traditional tide gauge records with satellite radar altimetry data; identifying its temporal as well as regional variability; developing a deep understanding of the processes driving this change; and providing quantitative projections of future change under different climate scenarios that he has been able to observationally test. His work has contributed to the assessments of the science of climate change by the Intergovernmental Panel for Climate Change and to the World Climate Research Program, and in the public debate on the evidence and underlying science of climate change.

INAUGURAL SUZANNE CORY MEDAL 2021

Professor John Endler FAA FRS

Professor John Endler is a world leading evolutionary biologist. His research explores the interplay between ecological, behavioural and genetic factors, and how they affect geographic variation and the process of natural selection in natural populations. His contributions are wide ranging and seminal. His scholarly books on how geographical variation can develop despite movement between habitats and his hypothesis of Sensory Drive are classics. The latter proposes that the environment sets the direction of the combined evolution of senses and signals, as well as mate and microhabitat choice behaviour. He pioneered this new interdisciplinary field of sensory ecology. Professor Endler has worked with a variety of species, notably wild guppies and bowerbirds, and topics from population genetics and evolution through behavioural ecology and visual physiology. He defined the properties of bird and other animal eyes to understand visual perception and visual illusions and the importance of colour perception in mating success and sexual selection.

INAUGURAL SUZANNE CORY MEDAL 2021

Professor Susanne von Caemmerer FAA FRS

Professor Susanne von Caemmerer is the pre-eminent authority on modelling metabolic, physiological, structural and environmental aspects underpinning photosynthetic CO₂ fixation in plant leaves. She changed the way we think about photosynthesis and gas exchange in leaves and remains at the forefront of this research. Her ability to combine mathematical modelling with experimental approaches and her progressive exploitation of ever more powerful molecular engineering methods throughout an outstanding career have refined and deepened our understanding of biochemical, physiological and environmental limitations to photosynthesis. Her research from leaf chloroplasts to global models of plant production aimed at enhancing photosynthetic rates in crop plants to increase their yields and adapt to climate change is now applied world-wide.

THOMAS RANKEN LYLE MEDAL 2021

Professor David McClelland FAA

Gravitational waves were predicted by Einstein's general theory of relativity more than 100 years ago. After 40 years of sustained experimentation, on 14 September 2015, the Laser Interferometer Gravitational-wave Observatory (LIGO) detected the death spiral of two stellar-mass black holes as the gravitational waves they emitted almost a billion years ago passed through two detectors in the US. Remarkably, the wave moved the mirrors in the 4 km-long detectors by a fractional amount equivalent to 1/1000th of the width of a proton, in so doing verifying one of the most challenging predictions of Einstein's General Relativity.

Professor David McClelland carried major responsibility as the lead Australian investigator in LIGO and has made major contributions to this famous detector including work on 'quantum enhancement' which increased the observable volume of the Universe significantly.

Mid-career honorifics

JACQUES MILLER MEDAL 2021

Professor Mark Dawson

Professor Mark Dawson is a clinician-scientist whose research spans the breadth of basic discovery science to translational medicine and clinical trials. He is internationally renowned as a leader in epigenetics, which is the study of the processes that regulate access to the cell's DNA template for gene expression, DNA repair or DNA replication. Epigenetic processes are conserved in all animals and plants and underpin normal development, tissue regeneration and ageing. When these processes are corrupted by DNA mutations, diseases such as cancer result. Professor Dawson's ground-breaking research has provided several novel first-in-class cancer therapies which he has taken from laboratory discovery through to clinical application by leading several international clinical trials as Principal Investigator.

JACQUES MILLER MEDAL 2021

Associate Professor Michele Teng

Associate Professor Michele Teng's research aims to harness the immune system to fight cancer. Her group performed the first preclinical experiments demonstrating that scheduling of immunotherapy before surgery to remove a tumour (called neoadjuvant immunotherapy) was much more effective in eradicating metastatic disease, compared to giving immunotherapy (called adjuvant immunotherapy) after surgery. This seminal finding served as the rationale to set up new comparative trials of neoadjuvant and adjuvant immunotherapy in many human cancer types. Recent neoadjuvant clinical trials of various cancers have verified the translatability of her research.

NANCY MILLIS MEDAL 2021

Professor Angela Moles

Professor Angela Moles' research is to understand the different strategies that plants have evolved to grow in ecosystems ranging from tropical rainforests to arctic tundra. She was the first to quantify global scale patterns in vital plant traits such as plant height, seed size and defences against herbivores. Her work has also revealed how quickly introduced plant species evolve when they are introduced to a new range with different environmental conditions. One such plant has changed so much since being introduced to Australia in the 1930s that it is becoming a new, reproductively isolated species. She is currently applying her understanding of the ways that environmental conditions shape plant ecological strategies to help understand the likely effects of climate change on Australian ecosystems. Professor Moles is nationally and internationally regarded as a leader in global scale ecology, and is an outstanding mentor, advocate and role model for women in science.

NANCY MILLIS MEDAL 2021

Associate Professor Cathryn Trott

During the first billion years, the first stars and galaxies formed and died, bathing the Universe in light and evaporating the hydrogen fog that existed beforehand. By using low frequency radio telescopes, Associate Professor Cathryn Trott hunts for this needle-in-a-haystack signal from the time of the first generation of stars. She has pioneered methods to observe this weak signal and separate it from all of the radio light from other galaxies that formed in the past 12 billion years. Observation of this signal requires advanced knowledge of our telescopes, and painstaking work to collect the thousand hours of clean data required to find it. She is a world-leader in the hunt for this exciting, important and fickle signal that will transform our understanding of the Universe.

Early-career honorifics

ANTON HALES MEDAL 2021

Dr Nicolas Flament

Dr Nicolas Flament works at the interface between geodynamics and geology by novel 4D mathematical modelling of flow deep in Earth's interior. He makes significant contributions to understanding our planet by connecting the evolution of the deep Earth with the evolution of its surface. He shows Earth was largely a water world for the first half of its history with little emerged land, with important implications for the oxidation of the atmosphere and the evolution of early life. He linked the evolution of Earth's topography, including the Australian landscape and the formation of the Great Dividing Range, to the motion of tectonic plates over Earth's dynamic interior. He also recently used an innovative synthesis of global geodynamic models with geophysical data to show how the evolution of the deep Earth is dynamic and linked to past configurations of tectonic plates, which is of fundamental importance to understanding the evolution of our planet.

CHRISTOPHER HEYDE MEDAL 2021

Dr Kevin Coulembier

Dr Kevin Coulembier's research is in the field of mathematics known as representation theory, which studies how abstract algebraic structures are manifested as the solutions to concrete systems of linear equations. This field retains a strong connection to its origin as the study of geometric symmetry both discrete and continuous, but more recently has developed far beyond this in tackling curved and infinite-dimensional spaces and arbitrary number systems. One of Dr Coulembier's most important discoveries was of a way to detect the presence of the classical type of symmetry known as an affine group scheme in a more exotic setting known as a tensor category; this problem had defied the efforts of some of the world's top mathematicians for almost thirty years. He has also solved several other important problems in infinite-dimensional representation theory, and has discovered new unified proofs of major theorems concerning the invariants of groups and supergroups.

CHRISTOPHER HEYDE MEDAL 2021

Dr Vera Roshchina

Dr Vera Roshchina is an exceptional mathematician and emerging international leader in the field of non-smooth optimization. Her main interest lies in finite dimensional geometry, more specifically, open problems that originate from continuous optimization and related fields. Some significant problems of this kind are in the geometry of polytopes, for example the polynomial Hirsch and Durer conjectures, critical point problems (Fekete problem, Sendov's conjecture) and convex variational problems, such as asymmetric Newton's aerodynamic problem. Resolution of these challenges is critical for making progress with numerous applications, from engineering and economics to medical research and data analytics.

DOROTHY HILL MEDAL 2021

Dr Sarah Perkins-Kirkpatrick

Dr Sarah Perkins-Kirkpatrick is a world-renowned expert on heatwaves. She has dedicated her career to studying key features of these high-impact events, including their definition, their observed trends, future changes, underpinning physical drivers, and the role of anthropogenic influence behind observed events. She has also been at the forefront of the emerging field of marine heatwaves.

FENNER MEDAL 2021

Associate Professor Eve McDonald-Madden

Associate Professor Eve McDonald-Madden aims to improve sustainable policy decisions in the face of inherent complexity in environmental problems – numerous, diverse interacting species, lack of knowledge about how systems work, the impacts of climate change and competing demands for energy, food, water, health, money and nature. The foundation of her work is to maximise the effectiveness of scarce resources while dealing with deep uncertainties. Associate Professor McDonald-Madden has pioneered new approaches to decision-making for key environmental concerns – deciding how to act under uncertainty about climate change, accounting for the reliability of predictions, evaluating the trade-offs in global land use planning to achieve sustainability goals and knowing when spending money to monitor or to learn about ecological systems is not helpful. Her work has far reaching implications for governments, NGO's and others who manage the environment.

GOTTSCHALK MEDAL 2021

Associate Professor Francine Marques

Associate Professor Francine Marques is an emerging global leader in cardiovascular research, who has shown how more dietary fibre will improve our blood pressure and lower chances of serious disease. Uncontrolled high blood pressure, also known as hypertension, can frequently lead to cardiovascular disease, and is the main risk factor for death globally. Yet in too many cases, hypertension is a direct result of our low-fibre, high-sodium Western diet. Through a series of influential and award-winning studies, Associate Professor Marques and her team have shown how gut microbes ferment fibre to create 'cardio-protective' molecules, which lower blood pressure and improve heart stiffness. These findings are important, because they mean we could treat or prevent cardiovascular disease through better diets and improved gut health.

JOHN BOOKER MEDAL 2021

Dr Bishakhdatta Gayen

Dr Bishakhdatta Gayen is highly recognised internationally for his cross-disciplinary research across fluid dynamics, environmental engineering and climate processes by addressing the basic physical mechanisms. His ground-breaking computer simulations of turbulent flow over ocean bottom topography have improved knowledge of the energy cascade from tidal motion to internal gravity waves and subsequent dissipation. He has provided the first turbulence-resolving simulations of the complex ice-ocean boundary layer and ablation of icesheets, leading to a new understanding of the mechanism controlling the submarine melting rates and accurate predictions for the dependence of melting rates on ocean conditions. His research also includes development of the first-ever ocean models with fully resolved turbulent convection and boundary layer processes, which provides important new insights to the role played in global ocean circulation by convection below the sea surface in polar seas.

LE FÈVRE MEDAL 2021

Associate Professor Debbie Silvester-Dean

Associate Professor Debbie Silvester-Dean is a global leader in the field of room temperature ionic liquids (RTILs), a new class of salt-like materials that are liquid at unusually low temperatures. Her research is focussed on their application as superior electrolytes in electrochemical reactions. Specifically, she has developed robust gelled sensor materials containing ionic liquids to detect toxic gases and explosives. These overcome the drawbacks of liquid-based electrolytes and will soon be tested in vehicles used in the WA mining industry. The sensors make people safer at home and work and can be used in various applications, including fumigation, refuelling, exhaust monitoring, and entering confined spaces. Associate Professor Silvester-Dean studies the fundamental behaviour of dissolved materials in RTILs. The results are used worldwide to understand electrochemical reactions, mechanisms, kinetics, and gas behaviour. They inform designs for batteries, capacitors, and transistors, as well providing smart materials for miniaturised, low-cost, high-performing sensors.

MORAN MEDAL 2021

Professor Christopher Drovandi

Almost every field of science requires sophisticated data analysis, and this in turn requires increasingly sophisticated methods for intelligent data collection and efficient computation. Professor Christopher Drovandi's research contributes substantively to both of these areas. He has created new methods for optimal design of experiments that facilitate more cost-effective, data-substantiated decision-making. His innovative research into synthetic likelihood estimation have freed traditional constraints of likelihood-based statistical modelling and computation. His application of these methods to diverse problems in computational biology and exercise science have generated new insights for scientists and managers in these fields.

MORAN MEDAL 2021

Dr Janice Scealy

Dr Janice Scealy's research focuses predominantly on developing new statistical analysis methods for data with complicated constraints including compositional data (vectors of proportions which sum to one), spherical data, directional data and manifold-valued data defined on more general curved surfaces. Her work has led to important new insights in a diverse range of applications. Her new flexible compositional model was applied to predict the proportions of total weekly expenditure on food and housing costs in Australia. Janice used a manifold data transformation to help identify geochemical processes acting on the surface of the Australian crust. She has developed multiple new statistical techniques for analysing noisy paleomagnetic datasets and her methods have led to improvements in uncertainty measurements of Earth's magnetic field.

PAWSEY MEDAL 2021

Associate Professor Xiaojing Hao

Associate Professor Xiaojing Hao is a world leader in next-generation kesterite photovoltaics; utilising green (earthabundant, environmentally-friendly) thin-film semiconductor materials to harvest sunlight. Over the past four years she has led her group in setting four world records for sulfide kesterite solar cell efficiency as confirmed by the US National Renewable Energy Laboratory. Her kesterite solar cell breakthroughs represent major advances in developing high bandgap thin film solar cells that are flexible, stable, cheap and non-toxic, showing clear societal impact as photovoltaics emerge as the front-runner in supplanting fossil fuels.

RUTH STEPHENS GANI MEDAL 2021

Professor Joseph Powell

An individual's chance of developing a disease or health condition is due to differences in their DNA. These differences mean that some people develop diseases such as diabetes, while other do not. Professor Powell's research is focused on understanding how these differences in DNA act at the level of individual cells – the building blocks of the human body. Gene expression – the mechanism by which information from DNA is translated into proteins – underscores the genetic risk for most diseases. Gene expression is controlled at an individual cell level, so ideally, analysis of gene expression should be performed using single cells. Professor Powell's research uses single cell sequencing technology to investigate why diseases arise in different cell types, and how early-stage diseases can be diagnosed and treated by targeting the specific disease driving cell populations.

Award events and lectures



Award ceremony at Government House, Canberra. CREDIT: NANCY PRITCHARD

2021 saw the inaugural Ruby Payne-Scott Medal and Lecture given by Emeritus Professor Cheryl Praeger AC FAA and the first online Matthew Flinders Medal lecture presented by Professor Andrew Holmes AC FAA FRS FTSE. It was also the first time that the Academy's premier and career honorific medallists gave online lectures, opening these events up to wider audiences across Australia and internationally.

Three award ceremonies were held in person at government houses in Hobart, Adelaide and Canberra to honour 2019, 2020 and 2021 recipients of Academy premier and career awards.

Pictured above (left to right): Awardee Hannan Medal 2019 **Professor Alan Welsh** FAA, Australian Academy of Science Chief Executive **Ms Anna-Maria Arabia**, Awardee Suzanne Cory Medal 2021 **Professor Susanne von Caemmerer** FAA FAS, Australian Academy of Science Vice President **Professor Malcolm Sambridge** FAA, Governor-General of Australia **General David Hurley** and **Mrs Hurley**, Awardee Thomas Ranken Lyle Medal 2021 **Professor David McClelland** FAA, Awardee Dorothy Hill Medal 2021 **Dr Sarah Perkins-Kirkpatrick**, Awardee Haddon Forrester King Medal 2020 **Professor Ian Campbell**, Awardee Moran Medal 2021 **Dr Janice Scealy**.

Lecture tours and conference funding announced in 2021

2022–23 ELIZABETH AND FREDERICK WHITE RESEARCH CONFERENCE

'Crafting a science agenda for critical zone research in Australia'

Associate Professor Sally Thompson and Associate Professor Talitha Santini from the University of Western Australia

2022–23 FENNER CONFERENCE ON THE ENVIRONMENT

'Compound events in Australia – strategic planning for multivariate risk'

Dr Nina Nadine Ridder, Research Associate at the ARC Centre of Excellence for Climate Extremes at UNSW Sydney and Dr Angela Maharaj, President of the Australian Meteorological and Oceanographic Society (AMOS).

Research awards announced in 2021

JG RUSSELL AWARD 2021

The J G Russell Award provides an additional \$7000 to projects funded through the Australian Research Council's Discovery Early Career Research Award. It is aimed at helping talented younger researchers as a token of the community's regard for them. It recognises the costs involved in experimental research, and can be used towards the costs of equipment, maintenance and travel. The award is made possible by the generosity of the late Miss J Russell.

The following were announced as recipients:

Dr Yaoxin Hu – to develop new energy-efficient construction materials for heating large structures

Dr Armandeed Kaur – for producing super-resolution images to study biological nanostructures and biochemical mechanisms relevant to food security, antibiotic resistance and viruses

Dr Xiaoxiao Zhang – for research in disease resistance in cereal crops and reduce waste in global food production

Dr Zhiliang Wang – to develop materials to convert sunlight into hydrogen-based energy sources, helping to address clean energy challenges



Melanie Wells, one of three recipients of the Margaret Middleton Fund, loves her job. PHOTO SUPPLIED.

MAX DAY FELLOWSHIP 2021

The Max Day Environmental Science Fellowship Award provides up to \$20,000 for early-career researchers working on the conservation of Australia's flora and fauna, the ecologically sustainable use of resources, and the protection of the environment and ecosystem services.

It is named in honour of Academy Fellow, the late Dr Maxwell Frank Cooper Day AO FAA, who spent a lifetime championing entomology, conservation and forestry, as well as helping other scientists.

Max Day Fellowships were awarded to:

Ms Lea Hannah – 'Harnessing next generation DNA sequencing to explore whether honeybees providing crop pollination services benefit from floral resource plantings'

Dr Laura Brannelly – 'Using genetic techniques to develop conservation strategies for an endangered frog species'

The following scientists were highly commended:

Dr Luke Jeffrey – 'Greenhouse gas guzzlers: Are methane consuming microbes active within the bark of endemic Australian wetland trees?'

Ms Maggie-Anne Harvey – 'Developing low-impact selenium agromining using *Neptunia amplexicaulis*'

Dr Stephanie Gardner – 'Deciphering the microbial signature of nitrous oxide producing ascidians'

MAX DAY FELLOWSHIP 2022

The 2022 Max Day Fellowship of \$20,000 for early-career researchers was also announced in 2021.

Two researchers received the fellowship for their work on the conservation of Australia's flora and fauna, the ecologically sustainable use of resources, and the protection of the environment and ecosystem services.

Max Day Fellowships were awarded to:

Dr Brock Bergseth – 'Bolstering conservation outcomes – understanding social and ecological effects of illegal fishing behavioural interventions'

Miss Bridget Campbell – 'Warrakan ganma: Bridging Western and Indigenous science to safeguard biocultural diversity'

Four researchers were highly commended:

Mr Tim Ghaly – 'Who lives inside fungi? Bacterial endosymbionts of plant-associated fungi'

Dr Stephanie Gardner – 'Quantifying the contribution of benthic invertebrates to global nitrous oxide production'

Dr Niloofar Karimian – 'Arsenic and antimony co-behaviour in soil under a changing climate: resolving unexplored interactions between microbiology, mineralogy and geochemistry'

Dr Alice Twomey – 'Enhancing resilience of coasts: nature-based solutions for flood mitigation'

GRAEME CAUGHLEY TRAVELLING FELLOWSHIP 2022

The Graeme Caughley Travelling Fellowship is offered every two years to an ecologist in Australia or New Zealand, with the purpose of sharing their expertise outside the Fellow's own country.

The Fellowship commemorates the work of Dr G.J. Caughley FAA in ecology and wildlife management. It is financed through the generosity of his friends and colleagues.

The 2022 Graeme Caughley Travelling Fellowship was awarded to:

Dr Peter Caley

Dr Caley's lectures will examine how Dr Graeme Caughley's body of work can be applied to contemporary issues in wildlife research and management, including the decline in bogong moth numbers and interpreting predictions based on species distribution models.

He will speak at Lund University in Sweden and several institutions on the South Island of New Zealand.

MARGARET MIDDLETON FUND FOR ENDANGERED AUSTRALIAN NATIVE VERTEBRATE ANIMALS 2022

The [Margaret Middleton Fund](#) for endangered Australian native vertebrate animals was established in 2000 with Dr Margaret Middleton, who donated generously to this fund across her lifetime. The fund provides grants to support emerging researchers with ecology projects that have tangible conservation outcomes for endangered native vertebrates.

Margaret Middleton Fund grants were awarded to:

Miss Chloe Robinson – ‘Does mammal reintroduction reconstruct arid food webs?’

Ms Melanie Wells – ‘Investigating the health of little penguins as a sentinel of Tasmanian ecosystem health’

Miss Shelby Ryan – ‘Optimising emerging drone monitoring technologies to accurately determine population density of koalas’

MORAN AWARD FOR THE HISTORY OF SCIENCE RESEARCH 2022

The [Moran Award for History of Science Research](#) provides up to \$5000 in funding each year, and is aimed at postgraduate students and other researchers with expertise in the history of Australian science.

The Moran Award for History of Science Research was awarded to:

Dr Lilian Pearce – ‘Toxic Legacies, Contaminated Communities: A history of lead poisoning and power in Broken Hill’

THOMAS DAVIES RESEARCH GRANT FOR MARINE, SOIL AND PLANT BIOLOGY 2022

The [Thomas Davies Research Grant](#) for Marine, Soil and Plant Biology is funded through a generous philanthropic bequest to the Academy from the estate of the late Thomas Lewis Davies. The fund offers annual research grants of up to \$20,000 each to early- and mid-career researchers in the fields of marine, soil and plant biology.

Thomas Davies Research Grants were awarded to:

Dr Niloofar Karimian – ‘Arsenic and antimony co-behaviour in soil under a changing climate: Resolving interactions between microbiology and mineralogy’

Dr Benjamin Schwessinger – ‘Deciphering the genomes and genetics of Australian orchid mycorrhizas from the *Tulasnella* and *Serendipita* genera’

Dr Akane Uesugi – ‘Experimental tests of driver-passenger hypotheses: effects of weeds, fire, and soil microbes on native plant restoration’

Dr Zoe Doubleday – ‘How will climate change affect the brain functioning of octopuses?’

Dr Linda Armbrecht – ‘Probing ancient Antarctic krill populations’

Dr Laura Ryan – ‘The rainbow connection: the importance of substrate colour on biodiversity in urbanised intertidal zones’

Dr Michael Haydon – ‘Time for growth: integrating metabolic signals in the plant circadian clock’

Dr Orpheus Butler – ‘Uncovering the key biological role of molybdenum in soil formation’

Dr Tatiana Soares da Costa – ‘Using supercomputers in the search for herbicides that inhibit amino acid production in plants’



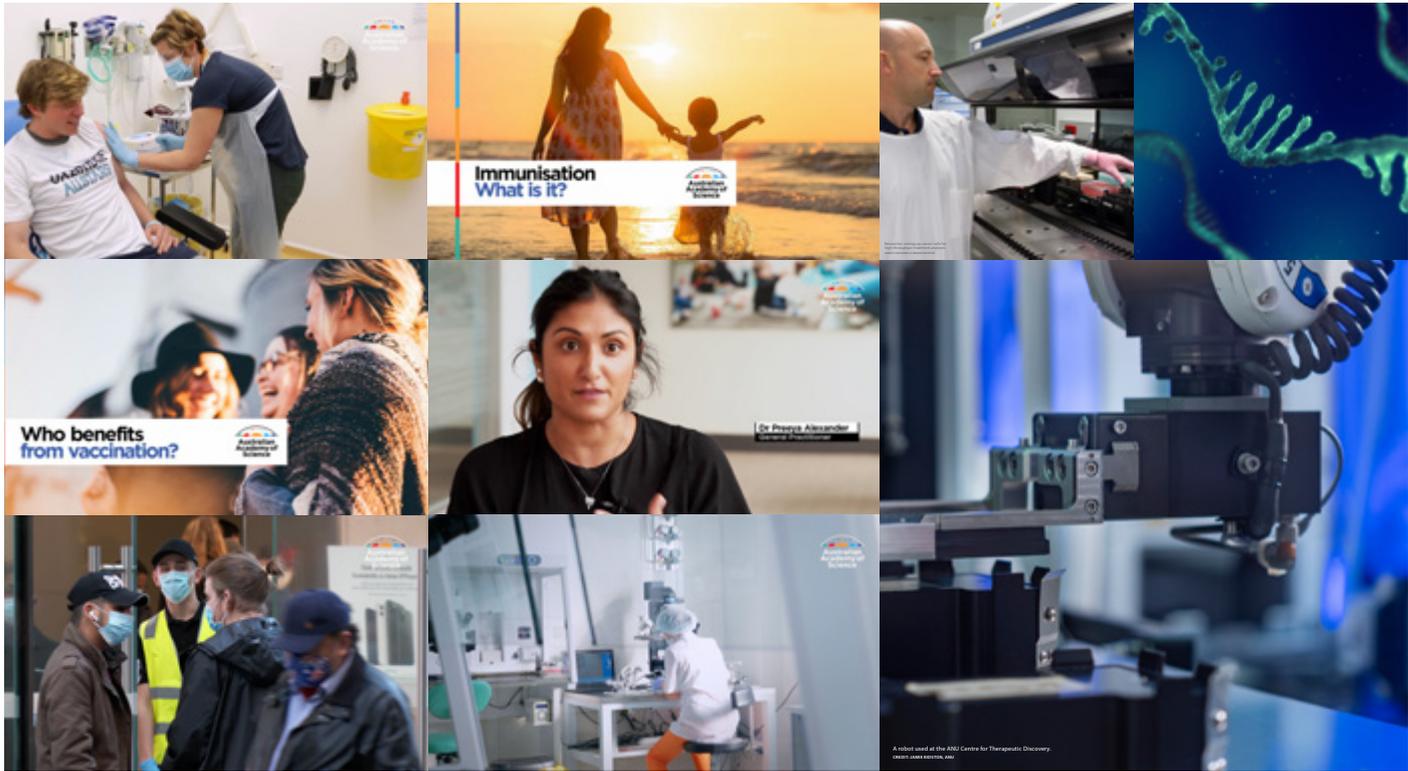
POLICY INFLUENCE AND ADVICE

The Academy provides independent, authoritative and influential scientific advice and aims to impact Australia's science agenda and be a trusted independent advisor on scientific matters.

2021 provided many opportunities for the Academy to contribute to important policy discussions and decisions across multiple disciplines. The Academy actively promoted the expertise of its Fellows and worked with the other learned academies and science and research organisations to provide comprehensive information and advice to policy-makers, in particular relating to RNA science and technology, data-intensive research, climate change and the impacts of feral horses in Australia's national parks. The Academy's Fellows and members of National Committees also contributed to providing policy advice to government. In 2021, the capacity of the science policy team was enabled through support from the philanthropic organisation Minderoo Foundation and other Australian philanthropists.

To support science policy in 2021, the Academy:

- | published 2 major reports:
 - | [The risks to Australia of a 3°C warmer world](#), and
 - | [Advancing data intensive research in Australia](#)
- | completed 20 [submissions to government](#)
- | made 5 [submissions to parliament](#), including giving evidence at 2 public hearings
- | led the publication of 1 [Rapid Response Information \(RRI\) Report](#)
- | published 8 [Science for Australians](#) features on topics including science funding in Australia, antimicrobial resistance and the impact of climate change on rainfall
- | published an [evidence brief](#) on the impact of feral horses on Kosciuszko National Park
- | published 3 [position statements](#) on open science, biodiversity conservation, and climate change and Australian science
- | convened 2 roundtables bringing together Australian expertise on [RNA science and technology](#), and [climate change and World Heritage](#)
- | hosted 3 PhD interns through the APR Intern program, supported by a [donation from Academy Fellow Professor Michael Barber](#).



COVID-19 and vaccination response

SCIENCE OF IMMUNISATION UPDATE

In May, the Academy launched an updated version of 'The science of immunisation: questions and answers', a guide to help counter misinformation and uncertainty surrounding vaccines for COVID-19 and other diseases. The refreshed guide, which was developed with the support of the Australian Government Department of Health, answers common questions about immunisation. It was developed to be used as a tool for guiding discussions between healthcare professionals and patients, between family and friends, and any conversations about vaccination.

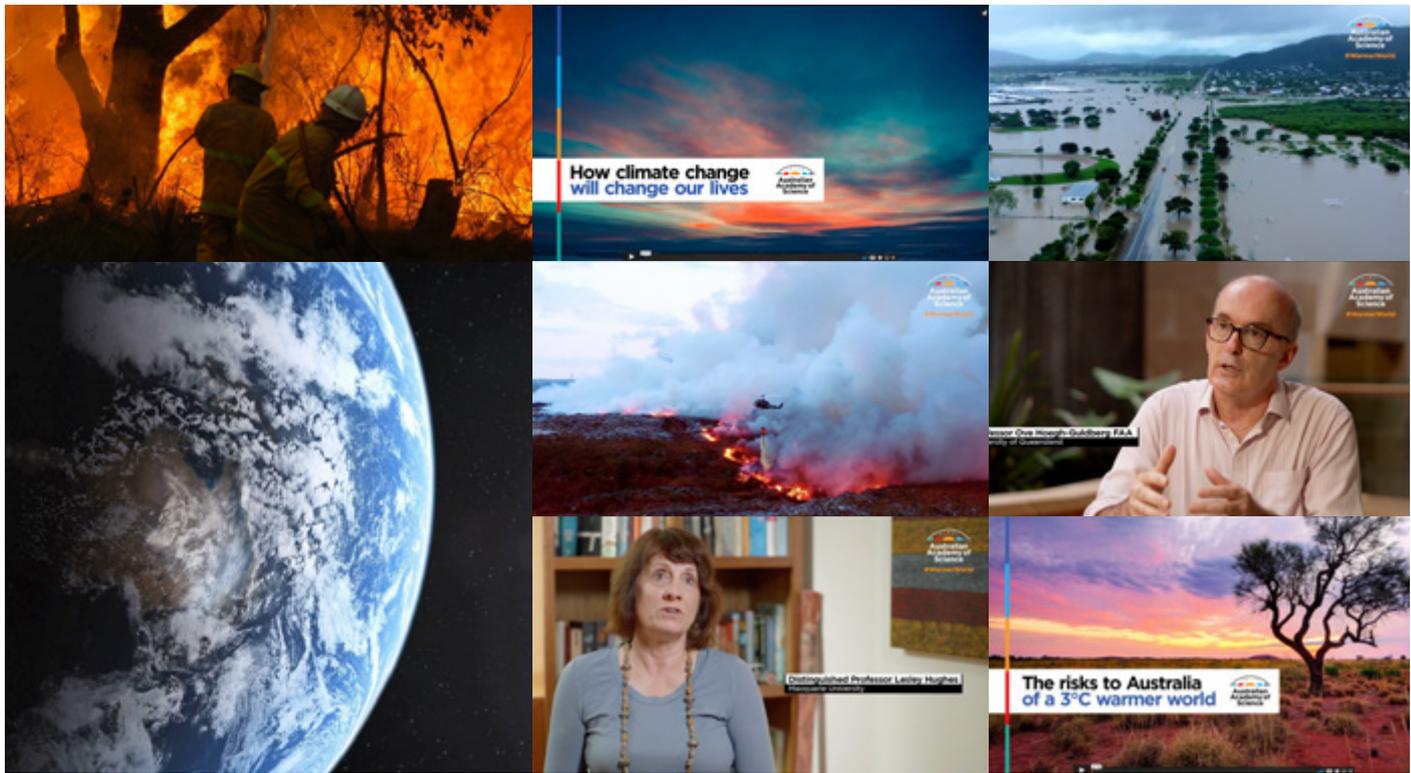
The guide was prepared by an expert working group of 12 members chaired by Academy Fellow Professor Carola Vinuesa, and was reviewed by an expert panel. The guide is available fully online as web content, as a downloadable PDF, and in print, and there are short easy-to-understand videos to watch and share.

Anyone can order free printed copies of the document through [the Australian Academy of Science website](#).

RNA SCIENCE AND TECHNOLOGY

In February, the Academy called for a sovereign RNA manufacturing capability in our pre-federal budget submission. In July, the Academy convened the National RNA Science and Technology Roundtable in partnership with the [Australia and New Zealand RNA Production Consortium](#). The roundtable gathered 38 of Australia's leading experts in RNA to identify national research priorities and make recommendations for creating a productive and sustainable pipeline of knowledge from discovery research to translation that will lead to clinical stage and commercial RNA manufacturing in Australia. An [outcome statement](#) and the [full proceedings](#) of the roundtable were released following the meeting.

Uniquely Australian problems stand to be solved by RNA science, including sensing new biosecurity threats, and supporting climate change adaptation in agriculture. In December, the Australian Government announced investment into an [Australian mRNA vaccine manufacturing capability](#). The agreement reached between the Victorian Government, the Australian Government and Moderna will significantly grow our sovereign capability to respond to future pandemics, as well as respond to uniquely Australian problems.



Climate change response

THE RISKS TO AUSTRALIA OF A 3°C WARMER WORLD

In March, the Academy launched a report called [The risks to Australia of a 3°C warmer world](#).

The report explored the risks to Australia's future based on the current global trajectory of greenhouse gas emissions, stating that the world must reach net zero emissions by 2050 if Australia is to avoid potentially insurmountable challenges to its cities, ecosystems, industries and food and health systems.

The report identified that Australia is well positioned to play its part in meeting this challenge, with a skilled workforce, strong industrial base and plentiful renewable energy resources facilitating easier emission reductions compared to many other countries.

It also highlighted that even if the world's governments meet their current Paris pledges on time, Earth is likely to reach average global surface temperatures of 3°C above the pre-industrial period during this century, with catastrophic consequences.

CLIMATE CHANGE HUB: SCIENCE AND SOLUTIONS

In October, in the lead-up to COP26, the United Nations Climate Change Conference, the Academy compiled a single hub of its climate resources for policymakers, researchers and the public. Accessible science videos are hosted alongside more detailed scientific reports and evidence briefs.

[Visit the climate change hub](#).

WORLD HERITAGE CONVENTION AND CLIMATE CHANGE ROUNDTABLE

In December, the Academy hosted the World Heritage Convention and Climate Change Roundtable in consultation with the Australian Academy of Law. The roundtable brought together 18 leading Australian experts in natural and cultural heritage, climate change and diplomacy to generate ideas to address the operational and legal consequences of climate change on World Heritage assets. A [statement](#) was released following the meeting.

Science policy positions and advice

AUSTRALIA'S DIGITAL FUTURE—A NATION OF USERS OR LEADERS?

In September, the Academy launched [Australia's Digital Future—a nation of users or leaders?](#), a summary for policymakers. The summary, by the Academy's National Committee for Information and Communication Sciences and the Australian Academy of Technology and Engineering, calls on the Australian Government to make emerging digital technologies a national science and innovation priority.

It says while the COVID-19 pandemic has accelerated the prioritisation of emerging digital technologies in Australia, they must now be recognised as an independent growth sector. The summary also recommends research and innovation in emerging digital technologies be included in the Australian Government's 2021 Research Infrastructure Roadmap. The new summary for policymakers follows the publication of a [strategic plan](#) in 2019 outlining Australia's potential as a digital nation.

ADVANCING DATA-INTENSIVE RESEARCH IN AUSTRALIA

In October, the Academy launched [Advancing Data-intensive Research in Australia](#), a report presenting findings from consultations with the research community on the challenges and opportunities of data-intensive research in Australia. It identifies opportunities to advance data-intensive research by aligning research policy, research infrastructure, skills and education, and recognising data science as a distinct scientific discipline.

The report, launched at the virtual eResearch Australasia conference, was written by Emeritus Professor Michael Barber (lead author), Professor Jane Elith, Dr Danny Kingsley and Dr Ayesha Tulloch. It was funded by the Australian Research Council under the Learned Academies Special Projects scheme.

RAPID RESPONSE INFORMATION REPORTS

[Rapid Response Information \(RRI\) Reports](#) are prepared on behalf of the National Science and Technology Council to deliver timely responses on specific questions raised by the Australian Government. The reports provide a responsive mechanism for ministers to access science and technology advice.

RRI Reports succeed the [Rapid Research Information Forum \(RRIF\)](#) which was initially established in 2020 to rapidly provide scientific evidence on COVID-19. RRI Reports embed RRIF capability into routine governance structures and expand it to address diverse science policy issues.

In 2021, the Academy led the development of one RRI Report, [Space Industry and the STEM workforce](#). The report responded to the question: What are the growth areas in domestic STEM skills to support jobs in the space industry, and how can these be addressed by the tertiary (university and relevant VET) sector? It involved seven expert contributors and nine peer reviewers, and it was the first rapid response style report produced on a non-pandemic topic. The Academy also worked closely with the office of the Chief Scientist to convene the expertise of Academy Fellows and other Australian scientist to provide advice on a range of topics.

The Academy's contributions to RRI Reports are [supported by the Minderoo Foundation](#).

FERAL HORSE MANAGEMENT

In October, the Academy published an [open letter](#) to the NSW Environment Minister Matt Kean calling on the NSW Government to work towards removing all feral horses from every NSW protected area. The letter had 69 signatories including Fellows of the Academy, other researchers and seven science organisations.

On the same day, the Academy published a [submission](#) in response to the public consultation for the Draft Kosciuszko National Park Wild Horse Heritage Management Plan. The Academy's submission included an [evidence brief](#) which summarises research on Kosciuszko National Park since 2018 and looks at horse numbers, horse and fire impacts and more. It finds that management strategies have been insufficient in alleviating the impacts of feral horses.



National Committees for Science

The Academy's 22 National Committees for Science foster their disciplines in Australia and are responsible for encouraging and maintaining linkages between Australia and the global scientific community. The committees provide guidance and advice on Australia's membership to the International Science Council (ISC) and 31 international scientific unions and interdisciplinary scientific committees of the ISC.

Domestically, the National Committees are responsible for engaging and supporting their respective discipline communities. This is achieved primarily by developing and implementing discipline-strategic plans along with periodic state-of-the-discipline reviews, and by contributing to scientifically informed policy through submissions, white papers and other input mechanisms facilitated by the Academy. The National Committees also initiate specialist forums, conferences and workshops.

DECADAL AND STRATEGIC PLANS

Australia's Future in Space: a decadal plan for Australian space science 2021–2030. [This ten-year plan for Australian space science](#) was created in 2021 by the National Committee for Space and Radio Science. The plan includes recommendations and strategies to advance national interests and priorities in space; growing the innovation economy, developing sovereign capability and improving the lives of all Australians.

Nourishing Australia Champions of the Decadal Plan To support the implementation of the [2019 Nourishing Australia: A decadal plan for the science of nutrition](#), the National Committee for Nutrition launched a Champions of the Decadal Plan program. A Champion of the Decadal Plan will communicate and promote the concepts outlined in the plan, and cite the plan in their research or other work-related activities.

National Committees also progressed the following reports:

- | [Physics decadal plan 2012-2021: Mid-term review](#)
- | [Bioscience 2030: recommendations for future curriculum](#)
- | Review of [The mathematical sciences in Australia: a vision for 2025](#)
- | Review of [The decadal plan for chemistry \(2016–2025\)](#)
- | [Evolutionary science for a changing world](#). A discussion paper from the National Committee for Ecology, Evolution and Conservation

CHANGES TO NATIONAL COMMITTEE CHAIRS

Incoming Chairs for 2021:

Professor Virginia Kilborn, National Committee for Astronomy

Professor Frances Separovic AO FAA, National Committee for Chemistry

Professor Adrian Burton, National Committee for Data in Science

Professor Alan Andersen FAA, National Committee for Ecology, Evolution and Conservation

Professor Helen Truby, National Committee for Nutrition

COMMUNITY OUTREACH AND ENGAGEMENT

The National Committee for Nutrition oversaw [scienceXart: food for thought](#), a curriculum-linked nutrition and art competition for school students to celebrate the International Year of Fruits and Vegetables.

The 2021 scienceXart competition was supported by [Dietitians Australia](#), the leading voice of nutrition in Australia.

To highlight opportunities for linking scienceXart: food for thought to align to the Australian Curriculum Foundation to Year 6, the Academy's education team produced teaching resources. This comprised of a series of activity plans for students from primary students to Year 6.



SCIENCE DIPLOMACY, INTERNATIONAL INFLUENCE AND SCIENCE ENGAGEMENT

The Academy is a champion, practitioner and proactive facilitator of science as a soft power asset through its global science linkages. To support the development of a coordinated program to establish and leverage science diplomacy as a national capability, the Academy identifies and scopes strategic opportunities to engage with the International Science Council (ISC) and other international bodies, develops proposals to strengthen ties with the Australian Government Department of Foreign Affairs and Trade (DFAT), provides input into policy submissions and UN consultations (with input from the Academy's Advisory Committee on International Matters and the National Committees) and produces the [Science Policy and Diplomacy Newsletter](#).

In 2021, the Academy participated in the International Science Council's 2nd General Assembly.

Through Foreign Secretary, Emeritus Professor Cheryl Praeger's membership of the ISC's Committee for Freedom and Responsibility (CFRS), the Academy:

- | co-authored a discussion paper on [Free and Responsible Practice of Science in the 21st Century](#)
- | contributed to statements regarding the protection of scientific freedom, in response to world events.

Accomplishments of Australian scientists were recognised by peak international bodies, including the following:

Dr Alex Held (CSIRO) became the first southern hemisphere winner of the Committee on Space Research's Massey Award for outstanding leadership and contributions to the development of space research.

Professor Martina Stenzel ^{FAA} (UNSW) was selected for a 2021 Distinguished Women in Chemistry or Chemical Engineering Award by the International Union of Pure and Applied Chemistry (IUPAC).

Mr David Luchetti (Department of Industry, Science, Energy and Resources) was selected as an Honorary Member of the International Astronomical Union (IAU) in recognition of his efforts to secure co-hosting the Square Kilometre Array (SKA) Observatory and signing the SKA intergovernmental treaty.

The Academy nominated more than 25 Australian scientists and researchers to leadership positions of international scientific unions.

Taxonomy Australia

The mission of [Taxonomy Australia](#), a program of the Academy, is to discover and document all remaining Australian species of plants, animals, fungi and other organisms, in a generation. It aims to increase the profile and understanding of taxonomy and biosystematics in the community and with government and industry; help bring about a greatly accelerated discovery and documentation of Australia's undiscovered species; and implement the recommendations of the decadal plan for taxonomy and biosystematics.

During the year, Taxonomy Australia organised the taxonomy and biosystematics sector to heighten public awareness of biodiversity loss – on the premise that if we don't discover the remaining 70% of species in Australia, we won't know what we have lost to fire and other natural disasters.

Taxonomy Australia launched a [report](#) by Deloitte Access Economics that investigated the cost-benefit analysis of the value of discovering new species. The report found that every \$1 invested in discovering all remaining Australian species will bring up to \$35 of economic benefits. The Deloitte report supports the mission to accelerate the discovery and documentation of Australia's remaining biodiversity.



Future Earth Australia

Future Earth Australia, a program of the Academy, is the Australian arm of Future Earth, a global sustainability, research and innovation network. Future Earth Australia is a national initiative that enables Australian researchers, governments, industry, peak bodies and civil society to connect and collaborate on sustainability transitions. Future Earth Australia partners with anyone researching on implementing sustainability knowledge and action, and particularly those working on systemic co-designed and co-produced outcomes for the implementation of the Sustainable Development Goals. It aims to initiate and develop relationships that enable collaborative action for societal transformation. It is leading important conversations that are informing and changing the national policy environment.

In 2021, Future Earth Australia:

launched a [Sustainable Oceans and Coasts National Strategy 2021–2030](#), based on extensive nation-wide consultation with a broad cross-section of ocean and coastal users, including the research sector, all levels of government, industry and business, Traditional Owners and managers across Country, civil society and community, as well as strategic insights from an Expert Working Group composed of experts from the field. The strategy provides seven recommendations intended to achieve sustainable oceans and coasts, as well as tangible action items that can be taken to achieve these ideas. The strategy is a cross-sectoral plan for achieving sustainable oceans and coasts across Australia by 2030

socialised the Sustainable Oceans and Coasts National Strategy 2021–2030 at an event at Questacon hosted by Ocean Decade Australia, as well as in a plenary presentation and workshop at the 2021 Coast to Coast Conference in Cairns. In the latter case, the strategy was formally endorsed by the over 300 conference delegates to the conference, and participants urged the Australian Government to adopt and implement its recommendations

served as the inaugural hosts of the Sustainability Research and Innovation (SRI) 2021 Congress, a global, transdisciplinary congress that brought together more than 700 speakers and 2000 participants from more than 100 countries, to meet online and in-person in Brisbane

led the Reimagining Climate Adaptation Summit, a fully online conference, with the support of the Institute for Culture and Society (Western Sydney University) and Sydney Environment Institute (University of Sydney). Over the course of three days, participants explored how Australia's climate adaptation and resilience agenda can be made more robust, effective and inclusive

designed and facilitated, in partnership with the Scientific and Technical Advisory Panel of the Global Environment Facility (STAP/GEF), a two-day workshop with social and behavioural scientists, systems thinkers and project practitioners with the goal of providing guidance on the behavioural aspects of project design. Read the [full report that resulted from this workshop](#)

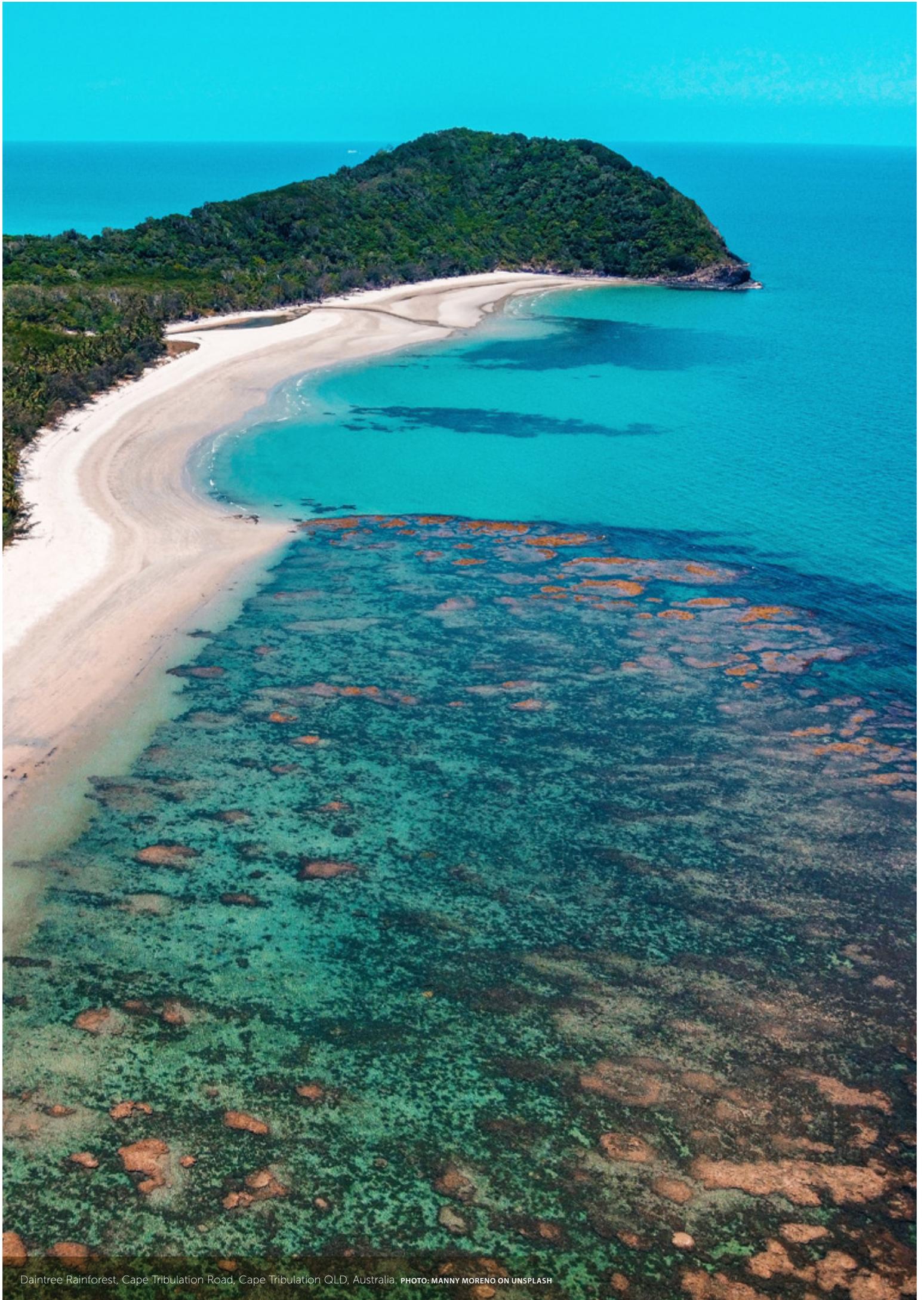
hosted a range of events and capacity-building workshops for its Early-Career Researchers and Practitioners Program, including an Empowering Future Leaders in Adaptation early career day, and an international policy impact for sustainability workshop

continued its Community Science for Sustainability program with two projects that were convened in 2020. The program convenes and manages partnerships between communities and researchers or specialists. For each project, communities and researchers work as equal partners to create research, guidance or tools to progress the community's sustainability priority

announced new projects for 2022 including the development of the National Strategy for Just Adaptation, and hosting of a satellite event for SRI2022.

More details can be found in [Future Earth Australia's 2021 Year in Review](#).





Daintree Rainforest, Cape Tribulation Road, Cape Tribulation QLD, Australia. PHOTO: MANNY MORENO ON UNSPLASH

EDUCATION

The Academy's involvement in school education focuses on providing support for teachers of science and mathematics spanning Foundation to Year 10 through its three programs, Primary Connections: linking science with literacy, Science by Doing, and reSolve: Mathematics by Inquiry.

Through facilitated professional learning, both face-to-face and online, complemented by exemplary research-informed and evidence-based teaching resources, the Academy is committed to delivering innovative programs at a national scale and with impact.

AUSTRALIAN GOVERNMENT GRANT 2020–21 TO 2024–25

Work commenced on the extension of the Academy education programs, funded by the Australian Government, to further develop and deliver innovative, high-quality online science and mathematics teaching and learning resources for teachers and schools across Australia.

One key focus of 2021 was a review of secondary school science, mathematics and STEM education in Australia to ensure up-to-date understanding of current needs and behaviours related to teaching and professional learning. The Academy also undertook a landscape review of the use of technology in and by schools, and opportunities and challenges to using technology effectively to enhance teaching and learning.

With more than 590,000 resources downloaded from the three programs' websites in 2021, **Primary Connections** and **reSolve** also engaged more than 700 pre-service and in-service teachers in online professional learning courses with feedback from participants indicating high levels of satisfaction.

Thank you for the excellent PD. The modules were very informative, and I will use ideas and resources to design assessments. It has also given me more confidence to teach science. PRIMARY CONNECTIONS PROFESSIONAL LEARNING PARTICIPANT

Thank you for an engaging opportunity to learn lots of new knowledge. It has been a great learning experience that we are keen to develop when we return to school. RESOLVE PROFESSIONAL LEARNING PARTICIPANT

In 2021, Science by Doing undertook an extensive review of the program with interviews and focus groups conducted with teachers and other experts to investigate usage and inform future updates and program development. Review findings informed a program refresh and renewal to commence in 2022.



Dr Rachael Fowler
Botanist
University of Melbourne

Projects

The Academy was involved in several special projects in 2021.

Australia–Indonesia Partnership for Innovation for Indonesia’s School Children (INOVASI) Program: Conducted a review and provided advice in relation to the school science learning frameworks and learning achievement standards. INOVASI is a partnership between the governments of Australia and Indonesia, managed by Palladium International Pty Ltd and funded by the Department of Foreign Affairs and Trade.

NSW Department of Education: Developed three online courses for the NSW Mathematics Strategy project. These will be offered in 2022 to all NSW Department of Education teachers of mathematics from Foundation to Year 10.

Victorian Department of Education and Training: Facilitated a workshop focused on inquiry learning and investigations for the Victorian Department of Education and Training Science cohort of the Primary Maths Science Specialists (PMSS) program.

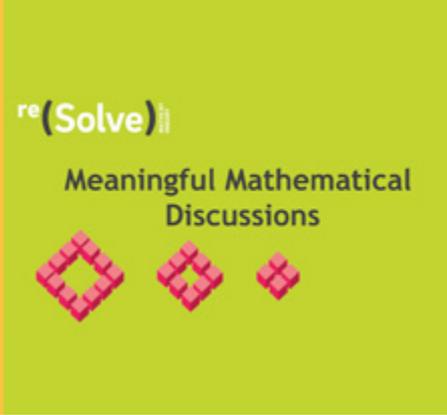
Eucalypt Australia: Produced a [video](#) to complement Primary Connections teaching resource ‘Among the Gum Trees’. The video brings to life the stories of scientists involved in building knowledge and awareness about eucalypts and their place in the Australian landscape. The video was produced by the Academy and funded by Eucalypt Australia.

The Invergowrie Foundation: Continued collaboration with The Invergowrie Foundation to develop and deliver a professional learning program for teachers on approaches and frameworks for STEM education. The program was evaluated by the University of Melbourne with findings indicating the program increased participants’ confidence and capacity for teaching science and STEM.

What an amazing four days of professional learning! The presenters were highly engaging and responsive to the learning needs of our group. We were presented with hands-on experiences to take back to our classrooms and information on the importance of STEM education to share with our colleagues at school. I feel confident to teach STEM and incorporate it successfully in my classroom program. PARTICIPATING TEACHER

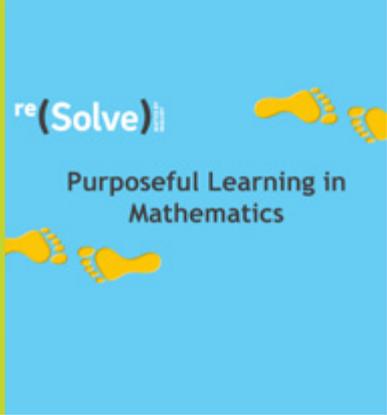


re(Solve) MATHS BY INQUIRY



re(Solve)

Meaningful Mathematical Discussions



re(Solve)

Purposeful Learning in Mathematics



Collaborations

Deakin University: Co-authored a [chapter](#) in Methodological Approaches to STEM Education Research Volume 2, published by Cambridge Scholars Publishing. The chapter 'Co-Design: Methodological Considerations in a Digital Design Project' explored Primary Connections' work with teachers during the Primary Connections Digital Transformation Project in 2019.

Geography Teachers' Association of Victoria: Published an article in the Geography Teachers' Association of Victoria's (GTAV) Interaction journal of September 2021 to highlight opportunities to incorporate the geography learning area when teaching with Primary Connections resources.

Australian Science Teachers Association: Collaborated on a national campaign to raise awareness of the importance of safety in school science whilst encouraging practical science investigation.

OTHER ENGAGEMENTS

- | Australian Curriculum, Assessment and Reporting Authority
- | Australian Institute for Teaching and School Leadership
- | NSW Education Standards Authority
- | Mathematics and Numeracy Hub and MOOCs Advisory Group

CONFERENCE PRESENTATIONS

- | ACT Directorate for Education
- | Australian Association of Mathematics Teachers
- | Canberra Mathematics Association
- | Deakin University STEM Ed
- | EduTECH
- | International Society for Design and Development in Education
- | Mathematics Education Research Group of Australasia



Dr Pauline Treble and Ms Carol Tadros in Jenolan Caves collecting water samples. CREDIT: ANSTO

DIVERSITY AND INCLUSION

The Academy aims to be a national leader in diversity and inclusion in Australia's science sector. It is committed to supporting excellence in science and empowering the next generation of scientists, and recognises that to achieve this it must celebrate and embrace diversity and inclusion in all its forms and embed diversity and inclusion in everything it does.

As a national learned academy, it has a responsibility to model, promote and influence best practice in diversity and inclusion in the science sector in Australia.

In 2021, the Academy:

continued to steward the [STEM Women](#) database, an online directory of over 3400 women in Australia working in science, technology, engineering and mathematics (STEM) that connects them to opportunities to progress their careers and personal capabilities. The Academy provides ongoing communication through monthly e-newsletters and virtual meetups to promote opportunities to the STEM Women community

continued to steward the [Women in STEM Decadal Plan](#) initiative, hosting a network of 39 Decadal Plan Champion organisations who have publicly aligned their gender equity activities with the six opportunities outlined in the Women in STEM Decadal Plan. This emergent network of leading STEM organisations spans all parts of the ecosystem, including academia and research, industry, small to medium enterprises, institutions and the public sector

commenced the [STEM Women Asia](#) project in partnership with the Association of Academies and Societies of Sciences in Asia and the InterAcademy Partnership. The platform is based on the successful STEM Women platform and features women scientists working in more than 30 countries across Asia and Oceania

conducted a research project on the [Impact of COVID-19 on women in the STEM workforce | Asia-Pacific](#). The project report presents the key findings of research into the impacts of the COVID-19 pandemic on women in the STEM workforce in the Asia-Pacific region. It explores the impacts on STEM careers and individual wellbeing and identifies ways organisations and individuals within the STEM system can support gender equity in STEM.



Early- and mid-career researchers (EMCRs)

The [EMCR Forum Executive](#), with the support of the Academy, conducted a survey of more than 300 EMCRs in May to investigate the impacts of COVID-19 on researchers. The [report](#) found significant effects on the mental health and productivity of EMCRs, and prompted a call for employers, governments and funding bodies to take action to support Australia's future science leaders. A survey conducted as part of the report found almost half of the women surveyed with caring responsibilities do not have access to flexible work, despite 60% of them saying flexible arrangements could better support their working conditions.

The survey included responses from 1109 individuals, including 865 women, from 31 Asia-Pacific countries and economies. This survey provides new evidence of the extent and impact that COVID-19 has had on the STEM workforce across the region. The report calls for STEM-related organisations across the Asia-Pacific to embed more flexible workplace cultures and to recognise that for those working in STEM research, flexible measures of work productivity are needed, especially in terms of publication records.

The Forum Executive shared insights from the survey on the ABC TV Program 'The Drum' in June and met with representatives of the National Health and Medical Research Council (NHMRC) in August, and with the Minister for Industry, Science and Technology, the Hon Karen Andrews MP, in September to discuss follow-up actions from the report to support the research sector.

[Science Pathways 2020: Global Dialogue](#), a conference planned for EMCRs, was cancelled due to COVID-19 restrictions. The Forum Executive instead implemented a strategy to support the EMCR community and keep researchers connected, including a series of [webinars and virtual catch-ups](#) to address the professional development needs of EMCRs in Australia and provide opportunities to network with peers.

SUBMISSIONS TO GOVERNMENT

The EMCR Forum made the following public submissions:

August

to the Department of Education, Skills and Employment consultation on the Job-ready Graduates Package

September

to the Senate inquiry into the Higher Education Support Amendment (Job-Ready Graduates and Supporting Regional and Remote Students) Bill 2020

to the inquiry into the Victorian Government's Response to the COVID-19 pandemic to comment on the ongoing impact of the COVID-19 pandemic on EMCRs in Victoria and outline measures the Victorian Government can use to support the Victorian research sector

October

to the Australian Medical Research Advisory Board consultation on the development of the Medical Research Future Fund (MRFF) Australian Medical Research and Innovation Priorities for 2020–22

to the Australian Research Council review of Excellence in Research for Australia (ERA) and the Engagement and Impact Assessment (EI)

to the Australian Research Council review of Excellence in Research for Australia (ERA) and the Engagement and Impact Assessment (EI).

THEO MURPHY INITIATIVE

Four activities were delivered as part of the Theo Murphy Initiative in the July 2020 – June 2021 financial year. These activities included:

inaugural activities for the EMCR program for the [Australian Citizen Science National Conference](#), in October 2020. Over 230 attendees joined all four events

[QueersinScience](#), which received support to become a national initiative to increase the sense of belonging of LGBTQIA+ individuals in STEM. The network grew from under 80 members in Victoria to close to 500 members from all around the country thanks to the support of the Theo Murphy Initiative

the [Reboot STEMM](#) think-tank, held online in June. 150 EMCRs joined the event

a [Catalysing Australia–Japan Science and Innovation](#) online information session to officially launch the symposium and showcase collaboration opportunities for EMCRs. The session was attended by 70 people.

Gender equity in science

STEM WOMEN ASIA

[STEM Women Asia](#) was launched in September, providing an online directory of women in Asia and Oceania working in STEM. Led by the Academy, STEM Women Asia was developed in partnership with the Association of Academies and Societies of Sciences in Asia (AASSA) and the InterAcademy Partnership (IAP).

Building on the success of the Academy's successful Australian version of the STEM Women platform which hosts more than 3400 profiles of women, STEM Women Asia extends the STEM Women platform to women in Asia and Oceania.

SCIENCE IN AUSTRALIA GENDER EQUITY (SAGE)

The Academy continued to contribute to and collaborate with Science in Australia Gender Equity (SAGE Ltd) and a detailed report of activities is available via its website: [SAGE Ltd Annual Report](#).

Reconciliation Action Plan

The Academy is committed to advancing reconciliation, creating opportunities to work respectfully with Aboriginal and Torres Strait Islander peoples, supporting their contribution to scientific activities, and increasing understandings of Indigenous knowledge. In 2021, the Academy continued to seek out and strengthen relationships with Aboriginal and Torres Strait Islander peoples based on mutual respect, with the intention of building our capacity to support and effect change through everything we do, and implement the actions contained in our Reflect Reconciliation Action Plan.

Since launching our 'Reflect' [Reconciliation Action Plan](#) on the UN International Day of the World's Indigenous Peoples, 9 August 2019, the Academy has collated a database of relationships across the Academy with Aboriginal and Torres Strait Islander organisations and individuals, and is exploring the possible creation of an Indigenous scientists network.

The Academy aimed to develop a deeper understanding and celebration of Aboriginal and Torres Strait Islander cultures, history and achievements, through:

- embedding the 'Core Cultural Learning: Aboriginal and Torres Strait Islander Australia Foundation Course', available via the [Australian Institute of Aboriginal and Torres Strait Islander Studies \(AIATSIS\)](#) to Academy Fellows and staff

- reviewing existing guidelines, such as an [Acknowledgement of Country guide](#) designed to support Fellows, staff and others to use at events and meetings.

The Academy will identify opportunities for direct action, be a catalyst for broader change and support the actions of others to make real change for Aboriginal and Torres Strait Islander peoples.

ULURU STATEMENT FROM THE HEART

In August, the Academy proudly [added its name](#) to those endorsing the [Uluru Statement from the Heart](#). We signed alongside the four other learned academies, as part of the Australian Council of Learned Academies (ACOLA), and we recognise the need to do more to acknowledge and understand the deep knowledge held by Aboriginal and Torres Strait Islander people.

NAIDOC WEEK—HEALING COUNTRY: CHALLENGES IN INDIGENOUS HEALTH AND MEDICAL RESEARCH

The Academy held an [online panel event](#) that featured Indigenous experts discussing the challenges and opportunities in Indigenous health and medical research. The NAIDOC Week theme of 'Heal Country' was central to this discussion. Eminent Australian epidemiologist and Academy Fellow, Professor Fiona Stanley facilitated the panel which reflected on the priority areas, and how COVID-19 has impacted research including collaboration and engagement with community. Thank you to our panellists Professor James Ward and Professor Ngjare Brown for their insights and knowledge.

GOVERNANCE AND TRACKING PROGRESS

The Academy continued to review and measure our progress and seek feedback and involvement from Aboriginal and Torres Strait Islander peoples to continuously improve our impact. We tracked progress of our Reconciliation Action Plan and provided regular updates to the Academy's governing body, the Council.

4.4+

million website visitors

COMMUNICATING SCIENCE

The Academy communicated with a broad range of audiences in 2021, including policymakers, the science sector and general public. There was a continued focus on communicating the science of COVID-19, along with a wider focus on the topics of immunisation and climate change. Digital and online communication platforms continued to be developed.

18+ million

impressions on social media

4.4+ million

visitors to our websites

70+ videos

published, nearly half of which were embedded in online mainstream media stories 615 times, and articles that were mentioned or quoted 122 times (across all media syndications)

37+ events

online and hybrid

Social media

Facebook: 2.3 million followers. Our content reached 10.7 million people and videos were viewed 2.8 million times and watched for 1 million minutes on Facebook. The Academy received 90,000 reactions, comments and shares on our posts in 2021.

Twitter: 57,500 followers. 1671 tweets were posted, which gained 110,000 engagements. The account received around 8 million tweet impressions for the year.

Instagram: 21,900 followers. 90 posts and stories were published and received 11,500 combined likes, comments, saves and story replies.

YouTube: 33,000 subscribers. Videos received 768,000 views, 872,880 minutes of videos were watched and 7.4 million impressions on YouTube were recorded.



Top science videos and articles

More than 70 videos were produced on varied science topics and to profile Academy Fellows and awardees.

The content that garnered the most engagement on Facebook in 2021 included: 'How to ram an asteroid', 'March equinox', 'Vaccine risks', 'Everything in life carries risks', 'Earth's core shifts speed', 'Tracking killer whales', and 'Lethal seahorses'. These posts ranged in reach from 282,000 to 773,000 people.

The Academy published 10 videos and 6 articles explaining the science and impacts of the pandemic to a broad audience on social media, and freely shared them with mainstream media.

The majority of the Academy's content on COVID-19 was funded by the Australian Government Department of Health, including videos, articles and infographics that informed the public about COVID-19 vaccination.

Videos were produced in partnership with Taxonomy Australia, Defence Science and Technology Group, CSIRO, Minderoo Lab, Eucalypt Australia and Women in STEM Asia.

The Curious website received 3.9 million visits, or 9% more than the previous year. Top articles were 'Animals that live forever', 'Batteries' and 'Which came first – the chicken or the egg?'

The Academy website received 1.54 million visits. Top visited pages related to climate change, immunisation and the pandemic.

Media

74 Academy news stories published on the website

Most-embedded single Academy video by online news media was 'What is La Nina?' (201 times)

825 – Total number of times Academy videos were embedded by online news media, including syndications

31 Academy videos embedded by online media

Most embedded or referenced article by online news media: 'Should I get a COVID-19 vaccine? How to weigh up your risks and benefit's – (105 times)

192 - Total number of times an Academy article was embedded or referenced by online news media, including syndications

23 Academy articles embedded by online media

5352 media stories about the Academy or mentions of the Academy across broadcast (2290) print (78) and online media (2984)

Newsletters and campaigns

144 email campaigns and newsletters were sent to subscribers of Academy email lists, which equated to 549,905 emails sent.



Events

The Academy participated in or delivered 37 events, which spanned from online to in-person and hybrid events, with a combined audience of thousands.

SCIENCE AT THE SHINE DOME

Science at the Shine Dome was delivered in a new format in 2021 to accommodate COVID-19 restrictions while engaging new audiences online. The series of events included online presentations by award recipients, a symposium exploring the theme Science and the Public Good, and online presentations by new Fellows of the Academy.

Science at the Shine Dome in 2021 included the following events:

- | Ruby Payne-Scott Lecture by Emeritus Professor Cheryl Praeger
- | Matthew Flinders Lecture by Professor Andrew Holmes
- | Symposium: Science and the Public Good
- | Career award events
- | New Fellows presentations days

PUBLIC SPEAKER SERIES: FOOD FOR THOUGHT

The 2021 Public Speaker Series was convened by Dr TJ Higgins AO FAA FTSE and Dr Emma Beckett, with the six-part series exploring the theme Food for Thought. The event speakers took audiences on a journey of taste, health and food innovations through topics such as genetic modification, food security, nutrition, gut health and alternative food sources.

WHAT IF SCIENTISTS RULED THE WORLD?

In May, a group of science communicators and actors created a unique interactive theatre performance at the Shine Dome called What if scientists ruled the world? The audience experienced an intriguing alternate world where science just might save humanity, or destroy it, depending on how it is used. The performance followed a Forum Theatre format, where the audience's words shape what will happen on stage.

A co-production of Falling Walls Engage and the Australian Academy of Science, this event was directed by Rebus Theatre in Canberra, with the participation of Science Engagers – part of the Falling Walls Engage Hub Australia.

COVID WEBINAR SERIES

The Academy collaborated with the Department of Industry, Science, Energy and Resources to deliver a series of online events focused on scientific responses to COVID-19. These events shared lessons from around the Asia-Pacific region for responding to the pandemic and build linkages to contribute to COVID-19 recovery. The events were delivered under the Australian Government's Regional Collaborations Programme, which increases scientific collaboration through research and innovation and covered important international topics such as genome sequencing, supercomputing, testing and tracing and indigenous populations, and how they all relate to COVID-19 research and collaboration.

PRIME MINISTER'S PRIZES FOR SCIENCE TEACHERS CELEBRATION

The Academy held an online event to acknowledge the 2021 Prime Minister's Prizes for Science teacher recipients. The event took the form of a panel discussion with the teachers who were awarded prizes for teaching excellence and those who were highly commended.

ARTIFICIAL INTELLIGENCE: FUTURE DIRECTIONS IN TECHNOLOGY AND LAW

In conjunction with the Australian Academy of Law, the Academy delivered an annual joint symposium for 2021. The topic was Artificial Intelligence: Future directions in technology and law.

The following events are covered elsewhere in this annual report:

- | **Falling Walls Australia** – see page 22
- | **NAIDOC Week** – see page 51
- | **Shine Dome** – see page 58



Science journals

HISTORICAL RECORDS OF AUSTRALIAN SCIENCE

Historical Records of Australian Science (HRAS) is published in January and July each year by CSIRO Publishing on behalf of the Academy. HRAS publishes peer-reviewed articles with supplementary material on the history of science in Australia and the southwest Pacific, biographical memoirs of deceased Fellows of the Academy, subject bibliographies, and book reviews.

The journal's editors are Dr Sara Maroske and Professor Ian Rae, and an Editorial Committee of Fellows and other experts guides the direction of the journal. HRAS is published online only, with hard copies available on request for an annual subscription fee. Biographical memoirs of Fellows are available free on the Academy website after publication in HRAS. Academy Fellows have access to the online version for free.

In 2021, the journal published 11 articles, 2 biographical memoirs and 17 book reviews.

AUSTRALIAN JOURNALS OF SCIENTIFIC RESEARCH

CSIRO Publishing and the Academy jointly published 14 journals of scientific research. The journals have an international readership, with subscribers in 90 countries. They can be accessed for free by scientists in more than 100 developing nations through the United Nations' Research4Life program. About half the published papers originate outside Australia. Editorial policy is determined by a Board of Standards, which is jointly chaired by CSIRO and the Academy.

CSIRO Publishing supports both 'Green' and 'Gold' Open Access to help authors reach the broadest audience and to enable unrestricted access to scholarly research. All Open Access articles undergo the same rigorous peer review as those published under a subscription model.



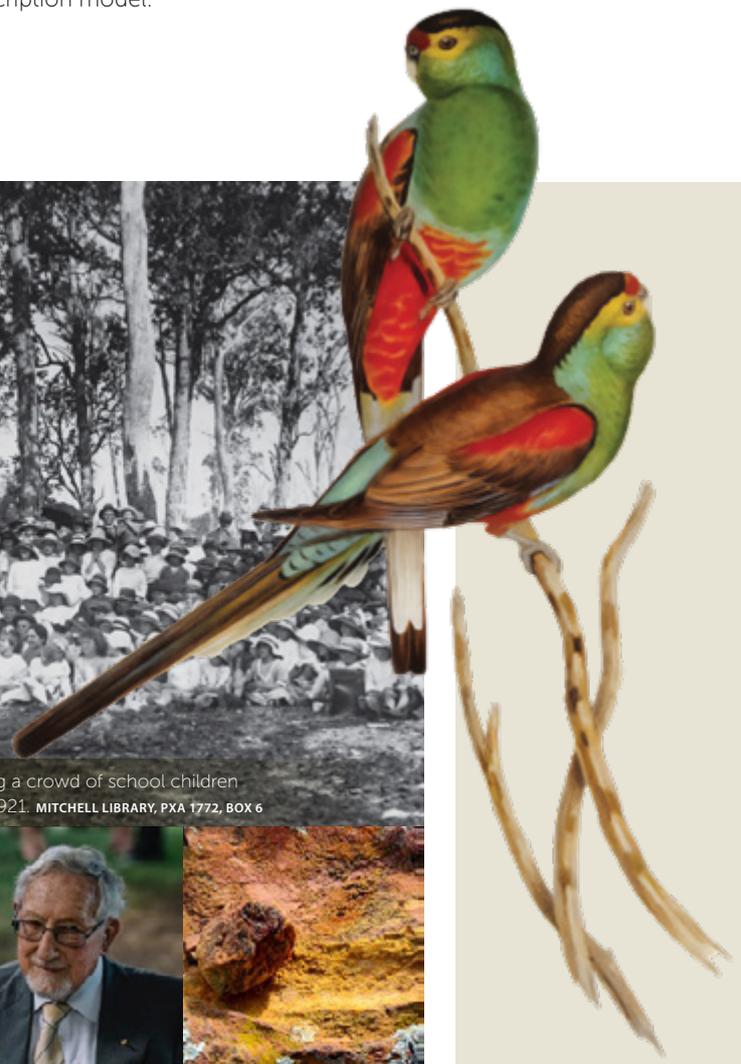
Alec Chisholm on Brisbane's Cleveland Pier around 1917. MITCHELL LIBRARY, PXA 1772, BOX 3



Alec Chisholm (far left) addressing a crowd of school children and their parents at Goomeri in 1921. MITCHELL LIBRARY, PXA 1772, BOX 6



The July issue of HRAS included (below from left) John Gooden and the Birmingham proton synchrotron; False testimony: the surveying career of Robert Hamilton Mathews; biographical memoirs for Sarah Elizabeth Smith and James Waldo Lance; Aspects of the historiography of Australian archaeology, and Alec Chisholm and the extinction of the Paradise Parrot.



Lithograph of two male Paradise Parrots by H.C. Richter, from John Gould (1848)

THE SHINE DOME

The Shine Dome is the home of the Australian Academy of Science and is a great source of pride for the Academy. The Shine Dome is both a meeting place for Australia's leading scientists and an iconic building that many people in Australia—and across the globe—recognise.

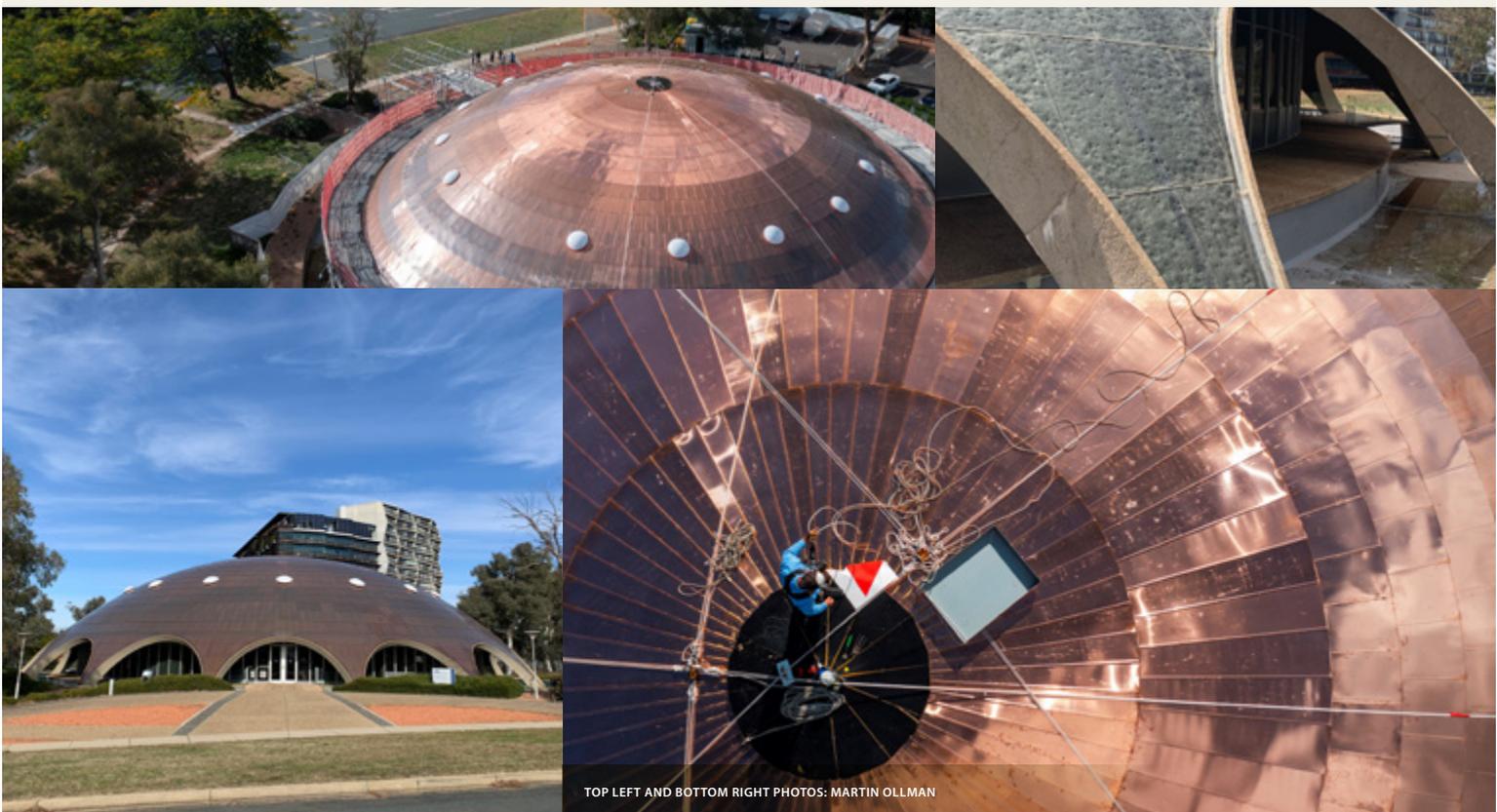
As with 2020, COVID-19 restrictions limited the opportunities for external hire of [the Shine Dome](#) as a venue for most of the year. In the latter part of the year it became available for external bookings and provided a unique venue for public and private meetings and events.

Shine Dome and Ian Potter House repair

After a hailstorm in early 2020 caused severe damage to the Shine Dome and Ian Potter House, both buildings required major renovations.

The Shine Dome's new copper roof was installed this year, restoring the Dome to a view that Canberrans would have experienced in the 1950s and '60s before the copper patina created the silver-blue colour many knew of the Shine Dome. 1880 new tiles of copper were individually cut and placed by hand to create this spectacular new roof.

Works began on the historic Ian Potter House, in the second half of 2021. Unanticipated delays in construction due to the pandemic delayed the project schedule, with the Academy Secretariat expected to return to Ian Potter House in 2022.



The Sustainable Shine Dome project

In 2020, the Academy committed to reducing its impact on climate change by working towards a net-zero emissions future for the Shine Dome. This year the Academy enacted on this commitment with the adoption of world-leading strategies and innovative approaches to ensure progressive energy and emissions reductions while protecting and sustainably managing the Shine Dome's national heritage values.

The University of Canberra partnered with the Academy to develop a sustainability plan that includes renewal or replacement of environmental systems at the National Heritage Listed Canberra landmark. This project was completed successfully in 2021. The extension of the Heritage plan was submitted to the Federal Department of the Environment who funded this research project, led by the University of Canberra. Two workshops were held as part of the research.

SHINE DOME ENERGY MANAGEMENT UPGRADES

During the year, the Shine dome had significant heating, ventilation and airconditioning (HVAC) upgrades to the fixed plant and equipment that will greatly assist with energy management and energy (cost) reduction.

The works completed in 2021 included:

- | provision of new electric heat pump systems
- | removal of the gas boiler system
- | provision of a new reverse cycle chiller
- | provision of new hot water heating pumps
- | updates to the building management system.

RENEWED ENERGY CONTRACTS

New electricity and gas contracts will see energy cost savings based on the following:

- | The Academy has been able to be included into the whole-of-government Defence Energy Contract which will see savings of approximately \$18,000 per annum.
- | The new ACTEW/AGL contract for Ian Potter House will see a 15% reduction in gas energy costs based on a revised domestic gas contract.

ACADEMY OPERATIONS

Governance

MEMBERS OF COUNCIL

Professor John Shine AC PRESAA FRS
President

Professor Malcolm Sambridge FAA
Secretary Physical Sciences

Professor Helene Marsh AO FAA FTSE
Secretary Biological Sciences

Professor Elaine Sadler AO FAA
Foreign Secretary

Professor David Day FAA
Secretary Science Policy (until May 2021)

Professor Ian Chubb AC FAA FTSE
Secretary Science Policy (commenced May 2021)

Professor Hans Bachor AM FAA
Secretary Education and Public Awareness

Professor Michael Barber AO FAA FTSE
Treasurer (until May 2021)

Professor Marilyn Anderson AO FAA FTSE
Treasurer (commenced May 2021)

Professor Lyn Beazley AO FAA FTSE
Member

Professor Bob Graham AO FAA
Member (commenced July 2021)

Professor Wendy Hoy AO FAA
Member (until May 2021)

Dr John Kirkegaard FAA
Member (commenced May 2021)

Professor Ivan Marusic FAA
Member

Professor Paul Mulvaney FAA
Member (commenced May 2021)

Professor Suzanne O'Reilly AM FAA
Observer

Professor Colin Raston AO FAA
Member (commenced May 2021)

Professor Louise Ryan FAA
Member (commenced May 2021)

Professor Halina Rubinsztein-Dunlop AO FAA
Member (until May 2021)

Professor Veena Sahajwalla FAA FTSE
Member (commenced May 2021)

Professor Frances Separovic AO FAA
Member (until May 2021)

Professor Jonathan Sprent FAA FRS
Member (commenced May 2021)

Professor Carola Vinuesa FAA FAHMS
Member (until July 2021)

Professor Bob Williamson AO FAA FAHMS(Hon) FRS
Member

MEMBERS OF EXECUTIVE COMMITTEE (EXCOM)

Professor John Shine AC PresAA FRS
President

Professor Malcolm Sambridge FAA
Secretary Physical Sciences

Professor Helene Marsh AO FAA FTSE
Secretary Biological Sciences

Professor Elaine Sadler AO FAA
Foreign Secretary

Professor Ian Chubb AC FAA FTSE
Secretary Science Policy (commenced May 2021)

Professor Hans Bachor AM FAA
Secretary Education and Public Awareness

Professor Marilyn Anderson AO FAA FTSE
Treasurer (commenced May 2021)

Professor Suzanne O'Reilly AM FAA
Spokesperson, Diversity and Inclusion

SECRETARIAT LEADERSHIP TEAM

Anna-Maria Arabia
Chief Executive

Melissa Abberton
Chief Operating Officer (commenced April 2021)

Trish Leahey
Chief Information Officer (until December 2021)

Andrew Hood
Chief Information Officer (commenced December 2021)

Paul Richards
Director, Communications and Outreach

Louise Moes
Director, Diversity and Inclusion (until October 2021)

Zach Ghirardello
Director, Diversity and Inclusion
(commenced December 2021)

Claudette Bateup
Director, Education

Karen Holt
Director, Fellows and Archives

Tayanah O'Donnell
Director, Future Earth Australia (until October 2021)

Nancy Pritchard
Director, International Programs and Awards

Chris Anderson
Director, Science Policy

Shauna McKay
Manager, Human Resources

Isobel Griffin
Manager, Philanthropy

Financial Report 2020–21

Read the Academy's financial report for 2020-21 at www.science.org.au/about-us/governance/annual-and-financial-reports/financial-report-2020-21.

Academy employees

At the end of the year there were 62 staff: 37 FT, 25 PT, 41 female, 9 male, 12 gender not specified.

The Academy hosted 7 interns for various periods.

