



Message from the Chief Executive—February 2018

February 15, 2018

Happy 64th birthday to the Australian Academy of Science!

‘On 16 February 1954 the ten members of the provisional Council of the Academy went to Government House, where they were ushered into a small room and welcomed by the Governor-General. They had to wait for some time as Prince Philip, whom the Queen wanted with her, returned late from opening University House, at the Australian National University. Then the Royal couple arrived with Sir William Slim, through a curtain without fanfare. The Petitioners were introduced and, with a few appropriate words, the Queen handed Oliphant, as President, the Charter of the Academy. Thus was the Australian Academy of Science founded.’

Excerpt from ‘The First Fifty Years’
Edited by Frank Fenner.

Sixty-four years on there is much to celebrate and our mission to advance science in Australia is as important today as it was then.

What a terrific start to 2018 with Professor Michelle Simmons FAA



Senator the Hon Michaelia Cash (second from left) with the Academy’s President Professor Andrew Holmes, Chief Executive Anna-Maria Arabia, and Director Science Policy and Projects Dr Chris Hatherly.

being awarded Australian of the Year and Professor Graham Farquhar AO FAA Senior Australian of the Year. A further 10 Fellows of the Academy received Australia Day Honours and we were delighted that a teacher of mathematics—Eddie Woo—was recognised as Australia’s Local Hero.

Ministerial engagement

The Ministerial reshuffle in December 2017 has resulted in a change in responsibilities for the science portfolio. Senator the Hon

Michaelia Cash is Minister for Jobs and Innovation and Senator Zed Seselja is Assistant Minister for Science Jobs and Innovation. The Academy’s President Professor Andrew Holmes; Dr Chris Hatherly, Director of Policy; and I were able to meet with Minister Cash to discuss priorities for the science sector and to share with her the activities of the Academy.

I hope you enjoy the February newsletter.

Anna-Maria

Academy Fellows win Australian of the Year awards

January 25, 2018

The Australian Academy of Science congratulates its Fellows Professor Michelle Simmons and Professor Graham Farquhar AO, who have been named the 2018 Australian of the Year and Senior Australian of the Year respectively.

Professor Michelle Simmons

Professor Simmons, who becomes the first female Fellow from the Physical Sciences to be named Australian of the Year, is the Director of the UNSW-based Centre of Excellence for Quantum Computation and Communication Technology and is a Fellow of ATSE, the Academy's partner in the Science in Australia Gender Equity (SAGE) program. Her Australian of the Year citation reads:

'One of the world's top scientists, Professor Michelle Yvonne Simmons has pioneered research that could lead to a quantum leap in computing and reshape the way we live and how we experience the world—her work is helping develop leading technology on a global scale, right here in Australia.

Since arriving in Australia from Britain in 1999, Michelle has transformed the University of NSW quantum physics department into a world leader in advanced computer systems.

In 2012, Michelle and her team created the world's first transistor made from a single atom, along with the world's thinnest wire. The breakthrough means Australia is now at the forefront of what

Michelle calls the "space race of the computing era".

Michelle's aim is to build a quantum computer able to solve problems in minutes which would otherwise take thousands of years. Such a discovery has the potential to revolutionise drug design, weather forecasting, self-driving vehicles, artificial intelligence and much more.'

Academy President Professor Andrew Holmes said Professor

Simmons' leadership in the field of quantum computing, and as a role model for young women scientists, are a shining beacon for Australian science.

"Michelle is someone who has always been willing to try the experiment that others never dared to do and this had paid off many times. What a thrill it is for Michelle's colleagues to be able to share in her wonderful achievements," Professor Holmes said.



Professor Michelle Simmons, 2018 Australian of the Year. Photo: L'Oréal Group



Professor Graham Farquhar AO, 2018 Senior Australian of the Year.

Professor Graham Farquhar

Biophysicist Professor Graham Farquhar is based at the Australian National University at the ARC Centre of Excellence for Translational Photosynthesis. His Senior Australian of the Year citation reads:

‘One of Australia’s most eminent scientists, Professor Graham Farquhar is helping reshape our understanding of photosynthesis—the very basis of life on Earth. His work focuses on food security and how the world will feed growing populations into the future.

After growing up with a Tasmanian farming family background, Graham has used his love of science to deliver practical benefits to the agricultural sector. His study of mathematics and physics formed the bedrock of a career creating mathematical models of how plants work.

His research addresses agriculture and climate change and aims to solve some of the greatest challenges of our generation. Graham has received a string of accolades during his distinguished career for his research examining how water efficient crops can protect food security in a changing climate. Importantly, he has worked to improve world food security by developing strains of wheat that can grow with less water.

In 2017 Graham became the first Australian to win a Kyoto Prize—the most prestigious international award for fields not traditionally honoured with a Nobel Prize.

From his long-term base at the Australian National University in Canberra, and now aged 70,

Graham is tackling some of the most profound challenges facing humanity and the environment.’

Academy Secretary for Science Policy, Professor David Day, said Professor Farquhar is one of Australia’s most eminent scientists and amongst the very best plant biologists in the world.

“Professor Farquhar’s seminal work on photosynthesis and the way plants use water forms the foundation for improving crop plant production in a world that is facing an ever-increasing demand for food in a changing climate,” Professor Day said.

“He has received many accolades for his crucial research and is a most worthy senior Australian of the year.”

Fellows recognised in Australia Day honours

January 26, 2018

The Australian Academy of Science congratulates its 10 Fellows who are among the 895 Australians

recognised in the Australia Day 2018 Honours List.

Four Fellows received the highest honour, each appointed a Companion in the General Division of the Order of Australia (AC), for ‘eminent achievement and merit of the highest degree in service to Australia or to humanity at large.’

Companion of the Order of Australia (AC)

Professor Jennifer Martin—For eminent service to science, and to scientific research, particularly in the field of biochemistry and protein crystallography applied to drug-resistant bacteria, as a role model, and as an advocate for gender equality in science.

Professor Trevor John McDougall—For eminent service to science, and to education, particularly in the area of ocean thermodynamics, as an academic, and researcher, to furthering the understanding of climate science, and as a mentor of young scientists.



Professor Jennifer Martin AC was one of 10 Academy Fellows to be recognised with an Australia Day honour.

Emeritus Professor Lewis

Mander—For eminent service to science through pioneering contributions to organic chemistry in the field of plant growth hormones, to higher education as an academic, researcher and author, and to national and international scientific societies.

Professor Ezio Rizzardo—For eminent service to scientific technological research and development in the field of polymer chemistry, to its application in the biomedical, electronics and nanotechnology context, as an author, and through mentorship roles.

Officer of the Order of Australia (AO)

Professor Martin Banwell—For distinguished service to science education as an academic, author and researcher, particularly in the field of synthetic organic chemistry, to scientific institutes, and as a mentor of emerging scientists.

Emeritus Professor Michael Barber—For distinguished service to higher education administration, and in the field of mathematical physics, particularly statistical mechanics, as an academic and researcher, and through contributions to science policy reform.

Laureate Professor Scott Sloan—For distinguished service to education, particularly in the field of geotechnical engineering, as an academic and researcher, to professional associations, and as a mentor of young engineers.

Member of the Order of Australia (AM)

Dr Robin Bedding—For significant service to science in the field of entomology as a researcher, and to the forestry industry both nationally and internationally.

Professor Sharad Kumar—For significant service to medical research in the field of cancer and cell biology, as a scientist and author, to medical education, and as a mentor.

Dr Hugh (Cecil) Tyndale-Biscoe—For significant service to science in the field of marsupial reproductive biology and ecology, as a researcher and mentor, and to professional societies.

Academy President Professor Andrew Holmes said he was delighted to see that a large number of Australia's best scientists have been recognised through the Australian Honours system.

"I congratulate them for their creativity and scientific integrity," Professor Holmes said.

"They are our scientific heroes and this recognition, together with that of Australian of the Year, Michelle Simmons, and Senior Australian of the Year, Graham Farquhar, gives us all great hope and optimism for the future, as well as much pleasure for the present."

Anyone can nominate any Australian for an award in the Order of Australia. If you know someone worthy, nominate them now <https://www.gg.gov.au>.

More about the 2018 Australian of the Year awards [science.org.au/news-and-events/news-and-](https://www.science.org.au/news-and-events/news-and-)

[media-releases/academy-fellows-win-australian-of-the-year-awards](https://www.aacademyofscience.gov.au/media-releases/academy-fellows-win-australian-of-the-year-awards)

Australian Academy of Science welcomes 2030 plan

January 30, 2018

The Australian Academy of Science welcomes the release of Australia 2030: Prosperity Through Innovation plan, prepared by Innovation and Science Australia <https://www.industry.gov.au/Innovation-and-Science-Australia/Australia-2030/Pages/default.aspx>.

The 2030 Plan correctly identifies the importance of taking a strategic approach to developing our national STEM capability, and makes a number of constructive recommendations, such as strengthening training for pre- and in-service teachers, better preparing students for post-school STEM occupations, and lifting student outcomes in literacy and numeracy (which should include the STEM disciplines).

The Academy has developed and is delivering a number of school education (Primary Connections, Science by Doing and ReSolve: Maths by Inquiry) programs targeting both students and teachers, which if scaled up will fulfil objectives of the 2030 Plan.

The Academy's President, Professor Andrew Holmes, said recommendations to establish a dedicated stream of funding for translational activity and a 'collaboration premium' on R & D tax incentives are also particularly important.

“Such arrangements are likely to be crucial for research funding over the coming decade, with the 2030 plan projecting government spending on R & D rising to almost 0.7 per cent of GDP out to 2030, with business R & D spending rising from 1 per cent of GDP to 1.7 per cent of GDP over the same period,” Professor Holmes said.

“It is imperative that Australia does better in translating research discoveries into commercial products and services. However this priority cannot be achieved without building our national capability in basic research to underpin the translation process.

“Australia’s most commercially successful innovations have commenced as basic research aimed at the public good. This includes Wi-Fi, penicillin, the cochlear implant, polymer bank notes, and many other examples,” Professor Holmes said.

The Australian Government must also continue to invest in national research infrastructure. The Academy recently welcomed the commitment to fund the National Computational Infrastructure facility, and looks forward to the Government’s investment strategy to fund the Chief Scientist’s National Research Infrastructure Roadmap.

The Academy also welcomes the recommendation to maintain a long-term policy commitment to greater gender diversity. The Science in Australia Gender Equity (SAGE) pilot, a national program promoting gender equity and gender diversity in science, technology, engineering, mathematics and medicine (STEMM) is aiming to deliver a

sustainable business model for an ongoing SAGE program, at the conclusion of the pilot in mid-2019. SAGE is a joint program between the Academy and the Australian Academy of Technology and Engineering (ATSE), funded by the Government under the National Innovation and Science Agenda.

The Academy also welcomes the 2030 Plan’s proposal for so-called “National Missions” to make Australia the healthiest place in the world in particular, a genomic medicine project, which the Academy recommended in its submission to the 2030 plan science.org.au/supporting-science/science-policy/submissions-government/2030-strategic-plan-innovation-science-research.

The Academy is also calling for a National Mission on Brain Health, emphasising research and outcomes in neuroscience and neurotechnology. A National Mission on Australia’s Hidden Minerals, to better identify and

harvest valuable mineral resources currently beyond our capacity to reach, would play a critical role in promoting Australia’s future economic prosperity.

Fellows’ research projects feature in ARC funding

February 06, 2018

The Australian Research Council has announced support for 22 research projects totalling more than \$9 million, with the aim of developing research–industry collaborations <https://rms.arc.gov.au/RMS/Report/Download/Report/a3f6be6e-33f7-4fb5-98a6-7526aaa184cf/186>.

Thirteen of the projects supported so far through the 2017 ARC Linkage scheme involve Academy Fellows, a clear demonstration of the extraordinary contributions that Fellows make to Australian science and innovation.

The Linkage Projects scheme supports university researchers to find practical solutions to problems



Professor Rick Shine is Chief Investigator for two projects funded under the ARC’s Linkage Projects scheme. Photo: Prime Minister’s Prizes for Science/WildBear

and challenges in real-world, industry-based settings.

The projects also rely on significant cash and in-kind support from industry partners, governments and community organisations.

Fellows' projects

Professor Rick Shine (CI)—Buffering the ecosystem impact of invasive cane toads. This project aims to address the devastating ecological problems caused by invasive species, by developing a novel approach that does not rely upon eradicating the invader through training vulnerable native predators not to eat toxic cane toads. Expected outcomes of this project include building a broad coalition of conservation-focused groups, from private land-owners and local businesses through to Indigenous groups and government and non-government agencies across the entire Kimberley region. It will also result in the evaluation of methods for deployment of taste-aversion at a landscape scale. This should provide significant benefits by conserving vulnerable fauna and building a powerful network within a region of high biodiversity in tropical Australia.

Professor Rick Shine (CI)—Cane toads in southern Australia: invasion dynamics and options for control. This project aims to investigate the spread of cane toads through southern Australia, an invasion front that has attracted far less research than the same species' expansion through tropical regions, even though toads severely impact native wildlife in both areas. This project expects to generate new

knowledge to determine why the rate of toad invasion is so much slower in New South Wales than in the tropics, and how best to modify newly-developed approaches to toad control to the conditions in southern Australia. Expected outcomes include predicting future trajectories of expansion, and identifying optimal approaches to toad control and impact mitigation. This should provide significant benefits for biodiversity conservation.

Professor Benjamin Eggleton (CI) et al.—Integration of broadband microwave photonic frequency convertors. This project aims to develop microwave photonic processors with increased bandwidth and unprecedented radio frequency signal processing. The new technology will enhance radar systems and electronic-warfare capabilities, and allow more flexible delivery of bandwidth for mobile communication systems. Benefits for Australian end-users and industry include improved surveillance for defence and revenue growth in companies working with the Australian defence forces.

Professor Lorenzo Faraone (CI) et al.—Defect engineering in molecular beam epitaxy-grown mercury cadmium telluride. This project aims to develop high quality mercury cadmium telluride (HgCdTe) materials with lower defect density and lower background doping levels. This will enable future, high-performance, lower-cost infrared sensors with the unique features of higher yield, larger array size and higher operating temperature. The project

will generate new science and technologies on defect engineering in the epitaxial growth of semiconducting HgCdTe on cadmium zinc telluride (CdZnTe) substrates. This will contribute to the development of core Australian industry sectors such as defence, environmental monitoring, medical imaging, earth remote sensing, mining, and oil and gas.

Professor Andrew Gleadow (CI) et al.—Dating the Aboriginal rock art sequence of the Kimberley in north-west Australia. This project aims to develop a robust time scale for the known Aboriginal rock art sequence in the Kimberley, Western Australia (WA). The project will use new knowledge of complex processes on sandstone surfaces across the north Kimberley, and an innovative combination of four scientific dating methods developed through our earlier work. The project expects to provide a well-dated sequence for Kimberley rock art based on replication of results, confirmation across different methods, and a large interdisciplinary dataset. The project will allow rigorous analysis of the relationship between dating results and rock art styles that has not previously been possible, and give new insights into Australia's deep Indigenous heritage. This will have a significant impact for future efforts in rock art conservation, and lay a foundation for cultural tourism, with important benefits for the local economy and health of regional Indigenous communities.

Professor John Gooding (CI) et al.—Bioinks for the 3D printing of cells made from off-the-shelf components. This project aims to

develop a simple method for creating complex, multiple-cell-type three-dimensional (3D) cell cultures for in vitro cell-based assays. Using 3D printing technology, this project will develop a versatile polymer system, made from entirely commercially available components, that gels upon printing and has functionality to assist cells in adhering, growing and migrating. The 3D printing of multiple cell types will provide biological scientists with more realistic in vitro cell assays to those found in vivo. Applications of the research are in cell biology, studying diseases and developing new drugs.

Professor Graham Goodwin (CI) et al.—Control strategies for bagasse-fuelled boiler units. This project aims to improve sugar production and electricity cogeneration capabilities in the sugar industry by utilising novel control ideas for boiler units. In the sugar industry, sugarcane residue is used as biofuel for boiler units. Boilers use steam to crystallise sugar and generate electricity. However, variable steam demand and poor fuel consistency severely hinder production. The project aims to improve safe operation of boilers, reduce downtime, and maximise electricity generated to the grid. This will provide significant benefits to sugar manufacturing and, more broadly, biofuel energy generation in Australia.

Professor Richard Hobbs (CI) et al.—Innovative seed technologies for restoration in a biodiversity hotspot. This project aims to develop and implement innovative and practical methods to improve native plant establishment

within a global biodiversity hotspot. As restoration efforts worldwide are hindered by altered substrates and invasive species, the greatest challenge is to reconstruct plant communities that are resistant to invasion and resilient within disturbed landscapes. The development of advanced technologies to enhance restoration success will benefit ecological communities impacted by urban expansion, agriculture and resource development, and their associated practitioners, government agencies, private landowners and primary Australian industry.

Professor David Lindenmayer et al.—Fauna, fuel and fire: effects of animals on bushfire risk. This project aims to determine the extent that animals influence fire regimes through effects on fuel load and characteristics. Minimising the risk of large, severe bushfires, while conserving native species is one of the greatest challenges facing managers of fire-prone ecosystems globally. Using a powerful combination of landscape-scale field observations, experimental manipulations of animal densities, and modelling, the project expects to quantify interactions between animals, bushfire fuel and fire regimes in south eastern Australian forests, woodlands and scrublands. This evidence should benefit the design of integrated, efficient, and complementary strategies for fire and fauna management in Australia's extensive fire-prone ecosystems.

Professor Craig Moritz et al.—Building resilience to change for mammals in a multi-use

landscape. This project aims to identify critical habitat and dispersal corridors for mammals by applying a novel, interdisciplinary landscape genetics approach to genetic and spatial data. The project expects to generate new knowledge on the evolutionary significance of landscapes in the Pilbara that have facilitated species persistence. Expected outcomes are the incorporation of evolutionary processes into multi-species, systematic conservation planning and enhanced capacity to inform conservation and sustainable development in the Pilbara. Significant benefits include alignment of conservation approaches across industry and government stakeholders, and implementation of best-practice conservation science in a biodiversity hotspot.

Professor John Endler et al.—Nutritional requirements of the critically endangered corroboree frog. This project aims to test the effect of dietary carotenoids on an extensive range of fitness-determining traits in the endangered southern corroboree frog. Unprecedented rates of species extinction have been reported for all vertebrates, with amphibians most severely affected. Captive breeding programs play a key role in amphibian conservation, yet there is a lack of knowledge regarding the nutritional requirements of threatened species. Manipulating captive nutrition is a cost-effective action that will permit recovery teams to more efficiently implement conservation actions. The findings will be of major benefit to amphibian conservation globally.

Professor Peter Lay et al., including Professor Emma Johnston—Clothes, fibres and filters that reduce pollution by micro and nano debris. This

project aims to provide scientifically verified methods to avoid, intercept and redesign products that cause the most abundant type of marine plastic pollution—clothing fibres—which has increased by over 450% in 60 years. It will determine how natural and plastic fibres, clothing brands and washing machine filters, alter fibre emissions and ecological impacts. This will enable protocols to improve products and the environment, and reduce health risks that will benefit the public, government regulation and companies in designing ‘eco-friendly’ products.

Professor Roger Tanner et al.—Emulsion explosives for rock blasting in extreme geothermal environments. This project aims to

understand the underlying mechanisms behind the physical and chemical breakdown of ammonium nitrate based emulsion explosives used for mining in geothermally active regions. It will apply this knowledge to develop a new class of high temperature- and pressure-resistant emulsion explosives. The resulting technology will be used in the safe and efficient mining of precious mineral deposits, such as gold, in geothermally active regions worldwide. The project will benefit the Australian mining industry by allowing mining of resources at deep levels, creating more jobs and increasing Australia’s export earnings.

Australian scientists welcome critical research infrastructure funding

December 18, 2017

The Australian Academy of Science welcomes the Australian Government’s commitment to fund a much-needed upgrade to Australia’s national supercomputer in today’s Mid-Year and Economic Fiscal Outlook (MYEFO).

The National Computational Infrastructure has received \$69.2 million funding in 2017–18 and \$0.8 million in 2018–19.

Secretary for Science Policy at the Academy, Professor David Day, said a new supercomputer is a critical piece of Australia’s economic, social and scientific infrastructure.

“This technology is vital for weather forecasting, health and medical research, climate change modelling, hazard management and ocean-safety,” Professor Day said.

“The new supercomputer will allow Australian scientists to continue to tackle complex challenges which would be impossible, unwieldy or inefficient without a supercomputer.”

The Academy also welcomes confirmation of \$50 million funding for the Australian Brain Cancer Mission to improve the survival rates of people living with brain cancer, \$70 million to support Australia’s next generation of medical research fellowships; and \$30 million to support Australia’s biomedical technology sector.

The Academy remains concerned about the potential impact of the higher education measures on both the pipeline of STEM graduates and vital research that is undertaken in Australian universities.

<https://youtu.be/WZGgKf1anoM>



The National Computational Infrastructure has received \$69.2 million funding in 2017/18 and \$0.8 million in 2018/19.

How an Australian kick-started the American atomic bomb project

February 15, 2018



Sir Mark Oliphant

A recent article in the Academy's history of science journal, *Historical Records of Australian Science*, reveals surprising insights about the involvement of the Academy's founding President, Sir Mark Oliphant, in the development of the atomic bomb by the Allies during WWII.

The article's author, Darren Holden, analyses the importance of Mark Oliphant's meeting with Ernest Lawrence and Robert Oppenheimer in September 1941 at the University of California, Berkeley. This was the meeting that, some would argue, ultimately led to the Manhattan Project.

Holden discusses that the British agencies had cautioned Oliphant and other scientists in their exchange with their US counterparts and had drawn up in a memorandum, which was to be signed, the rules of engagement and how the knowledge exchange was to take place. Oliphant's signed secrecy declaration has never been found.

Holden presents archival evidence showing Oliphant breached security protocols and circumvented the correct channels in passing on bomb physics secrets in 1941. However, Holden argues that it should not be assumed that Oliphant's so-called 'indiscretion' shows carelessness or an anarchistic attitude towards the rules. In contrast, he argues that Oliphant's Berkeley meeting was not a 'careless blurt-out of secrets, but a risk-managed event', and falls under the definition of 'an invisible college'. Holden explains that the role of the invisible college in science involves putting aside secrecy or self-interest to share ideas and test hypotheses, bypassing the usual formal channels dictated by institutions.

As Holden observes, 'the Allies ... won the first atomic arms race through not only the fine intellect of their scientists, but also through scientific social networks built on friendship and trust. [Oliphant's] ... belligerence, impatience and trust in fellow scientists, irrespective of secrecy provisions, paved the way for an accelerated development of atomic warfare.'

Also in the latest edition of the journal there are articles on non-CO₂ greenhouse gas research at CSIRO up to 1990 and early developments in radiocarbon dating at the Museum of Applied Science in Victoria, as well as biographical memoirs for Academy Fellows Brian Kay, James Morrison and Lawrence Nichol.

Fellows can access the journal's content at no cost by logging in to the Fellows' page of the Academy's website and following the link.

Read more from *Historical Records of Australian Science* <http://www.publish.csiro.au/hr>

Recent contributions to Government policies

February 15, 2018

The Academy regularly provides the Australian government with feedback on important policy measures. Following is a round-up of the Academy's submissions since November.

See all Academy submissions in full science.org.au/supporting-science/science-policy/submissions-government

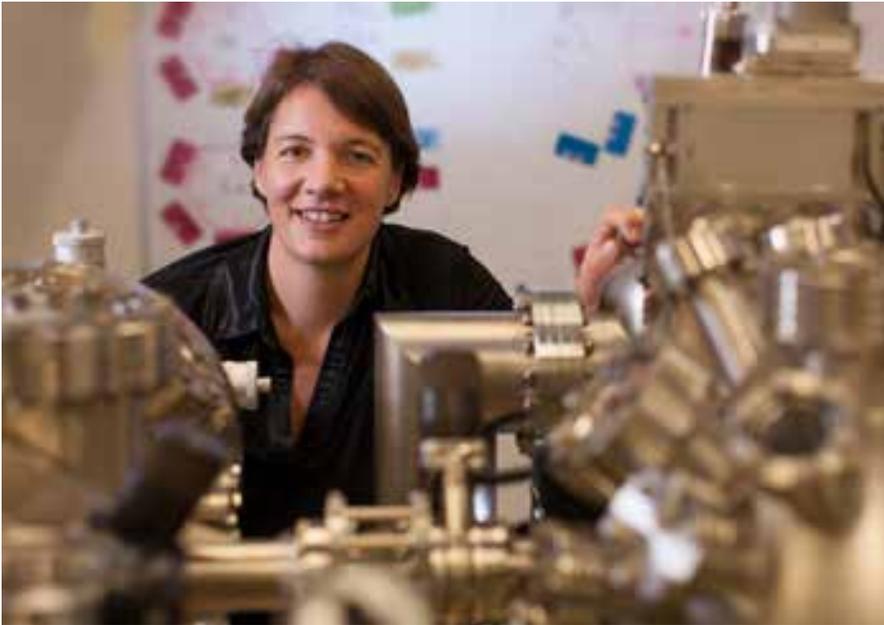
Industry's role in enhancing STEM education

The STEM Partnerships Forum is an initiative under the National STEM School Education Strategy and is chaired by the Chief Scientist of Australia Dr Alan Finkel AO to support more efficient and effective partnerships between schools, industry and the tertiary education sector.

The STEM Partnership Forum released an Issues Paper *Optimising STEM Industry–School Partnerships: Inspiring Australia's Next Generation*, and the Academy provided a submission in response. The Academy strongly supports the mission to develop a framework for industry to play a greater and more constructive role in enhancing the role of STEM in Australia's education system.

Migration program must support recruitment of overseas scientists

Australia's migration program must support our research institutions in



The 2018 Australian of the Year, Academy Fellow Professor Michelle Simmons, is one of many world-leading scientists who have come to Australia and contributed to the nation's—and the world's—scientific progress.

recruiting world-leading scientists and researchers to advance Australian science. That was the Academy's strong message in a recent submission to the Australian Government, which is seeking stakeholder advice on future directions for Australia's migration program—in particular, the level and the mix of next year's intake.

More than one-third of our science, technology, education and mathematics (STEM) workforce was born overseas. Australia's migration program enables us to leverage significant scientific international research programs to focus on Australia priorities, and Australian scientists are able to train and work in international research institutions and bring back critical knowledge, skills and contacts. We also benefit when scientists from around the world visit and work in Australia; overseas-born researchers have played an integral role in many Australian innovations, and will be instrumental in solving many of the critical scientific and related

challenges facing Australia in the future.

Australia's migration policy and program can support the Government's science, innovation and technology policies through promoting dedicated visa and migration pathways for our science workforce, allowing them to visit and work in Australia for periods of up to five years; providing pathways to permanent residency for skilled professionals and workers; and supporting cooperation between government agencies and research institutions to ensure institutional requirements are met.

Read the migration program submission science.org.au/supporting-science/science-policy/submissions-government/managing-migration-intake

Review of the National Gene Technology Scheme 2017

The Academy and ATSE made a joint submission to the second consultation phase of the Department of Health Review of the

National Gene Technology Scheme 2017.

The two organisations consider that regulation should be based on the products and outcomes of technology applications rather than on the technical processes used to achieve them, and that regulation should focus on the potential of modified organisms to harm human health or the Australian environment.

Read the gene technology review submission science.org.au/supporting-science/science-policy/submissions-government/joint-submission-gene-technology-review

Pre-Budget submission to the 2018–19 Federal Budget

The submission to the Treasury on the Academy's priorities for the 2018–19 Budget was made in the context of the Government's National Innovation and Science Agenda. The Academy proposes a series of affordable, practical and realistic investments that would make significant contributions to broadening and deepening Australia's science capabilities and deliver superior science and innovation outcomes.

Read the pre-Budget submission science.org.au/supporting-science/science-policy/submissions-government/2018-19-pre-budget-submission

The Great Barrier Reef Coastal Ecosystems Position Statement

The Academy made a submission to the Great Barrier Reef Marine Park Authority consultation on the Coastal Ecosystems Position Statement, the purpose of which is

to improve the health of the Great Barrier Reef and outcomes for coastal ecosystems.

The Academy welcomes the goal of improving the health of the Great Barrier Reef, but considers that the 2050 Reef Sustainability Plan to improve the reef every decade between now and 2050 is no longer possible due to the bleaching of two-thirds of the shallow-water corals in the central and northern parts of the reef. The Academy is concerned the reef may no longer be able to return to its condition of 1981, when it was inscribed as a World Heritage Area by UNESCO.

Read the Great Barrier Reef submission science.org.au/supporting-science/science-policy/submissions-government/submission-coastal-ecosystems

Digital Economy Consultation Paper

The Academy's National Committee for Information and Computer Sciences made a submission in response to the consultation paper The digital economy: opening up the conversation, issued by the Department of Industry, Innovation and Science.

The Committee outlines its vision for Australia's digital economy in 2030. It identifies two key areas in which government can contribute: promoting the development of the digital economy, fostering innovation, and providing policy settings that assist digital entrepreneurship.

Read the digital economy submission science.org.au/supporting-science/science-policy/submissions-government/

submission-australian-government-digital

Space Vehicle Tracking and Communication Facilities Treaty

The Academy's National Committee for Space and Radio Science made a submission to the Joint Standing Committee on Treaties inquiry on the proposed Agreement between the Australian and US governments for Space Vehicle Tracking and Communication Facilities.

The Committee supports the Agreement's aim to formalise arrangements between Australia and the USA regarding operation of NASA space tracking and communication facilities, as it delivers substantial dividends to both parties. The Committee believes the Agreement will also facilitate ongoing collaboration between Australian and NASA scientists and provide employment for specialist Australian personnel. Overall, the shared facilities, the data they generate, and the cooperation between Australian and US scientists deliver substantial benefits for Australia's broader national and scientific interests.

Read the Joint Standing Committee on Treaties submission science.org.au/supporting-science/science-policy/submissions-government/submission-joint-standing-committee

Review to achieve educational excellence in Australian schools

The Academy made a submission to the Department of Education and Training Review to Achieve Educational Excellence in Australian Schools.

Improving Australian students' performance in STEM subjects requires sustained and significant efforts from the Australian Government and state and territory governments, as well as from schools, universities and sector-based organisations. The Academy recommends detailed consideration of the way national and international performance metrics are used, and a focus on supporting new and existing teachers through best-practice, evidence-based programs and training. Education programs should be built around an inquiry-based learning model, which the Academy has been developing in science and maths for many years, as these have been shown to be highly effective in improving student engagement and teacher abilities.

Read the educational excellence submission science.org.au/supporting-science/science-policy/submissions-government/submission-education-excellence

Read a summary of the submission science.org.au/news-and-events/news-and-media-releases/review-aiming-achieve-excellence-schools

EMCR Forum update—February 2018

February 15, 2018

New leaders for EMCRs in 2018

The Early- and Mid-Career Researcher (EMCR) Forum welcomes five new executive members in 2018.

Dr Vanessa Wong is passionate about talking to the general public



The new executive members of the EMCR Forum are (from left) Vanessa Wong, Adrian Murdock, Emma Beckett, Michael Bowen and Justine Shaw.

about the importance of soils. She joins the EMCR Forum executive committee from Monash University.

Dr Adrian Murdock is from CSIRO and his research focuses on making and studying new nanomaterials. He has also been a guest science presenter for BBC Radio Oxford.

Ms Emma Beckett also appears regularly on local and national radio, where she busts myths about nutrition. In her day job she is an NHMRC Early Career Fellow at the University of Newcastle studying the interactions between our genes, the food we eat and the environment we live in.

Dr Michael Bowen strives to find drugs to treat brain disorders at the University of Sydney, where he is Senior Lecturer. In 2016 Michael was inducted into the World Economic Forum's Young Scientists Community, which recognises the top 50 scientists around the world aged under 40.

Dr Justine Shaw is a Research Fellow at the University of Queensland, but she spends most of her time in Tasmania, Antarctica or somewhere in the sea between the two. Justine's research focuses on Antarctic conservation and she is co-founder of Women in Polar Science and one of the leaders of the Homeward Bound leadership program.

In 2018 the EMCR Forum will be led by a new Chair, Dr Drew Evans, and Deputy Chairs, Dr Róisín McMahon and Dr Hamish Clarke. All were major contributors to the Forum in 2017, with Drew and Róisín being involved in launching the Kick-starting Collaboration at Science meets Business and Hamish serving as the editor of the EMCR Pathways newsletter. The 2018 committee will be rounded out by Dr Amber Beavis and Dr Carly Rosewarne, in the past Chair role.

The EMCR Forum executive members will next meet at its annual planning meeting in February.

EMCR conference: Diversify your thinking

Registrations are now open for the EMCR annual conference, Science Pathways 2018: Diversify your thinking, to be held on 23–24 April in Brisbane.

This is Australia's premier conference for career development of EMCRs from academia, industry and government and offers unique opportunities to network with leading scientific professionals from some of Australia's top organisations in public and private enterprise.

Most importantly, this event aims to engage Australia's early- and

mid-career researchers, across all disciplines and from around the country, in active discussion. The Forum wants to learn more about the specific challenges EMCRs face and, with participants, devise some possible solutions—both aspirational and practical.

The EMCR Forum is committed to supporting equity, diversity and inclusion, and has arranged various schemes to facilitate attendance at the event as well as on-site support and accessibility.

Published research and collaboration outcomes of EAPSI program

February 15, 2018

In 2010, US postgraduate student, Holly Woodward Ballard, travelled to Australia for two months as part of the National Science Foundation's East Asia and Pacific Summer Institutes (EAPSI) program, which is supported by the Australian Academy of Science.

Holly researched fossil bone tissue microstructure from dinosaurs living in extreme environments, like the Antarctic Circle. Bone tissue contains the growth record of an individual, providing detailed life history information, such as growth rate and age. The dinosaurs living in

Victoria 120 million years ago would have experienced freezing conditions and months of complete darkness, and Holly wanted to know how such an environment affected their biology or behaviour.

Professor Patricia Vickers-Rich and Dr Tom Rich collect dinosaur fossils from Victoria and curate them at the Melbourne Museum. They supported Holly's research proposal and became collaborators.

The initial results of her research visit and their collaboration were published a year later in the journal PLoS ONE. They discovered that the little dinosaurs living in Antarctic conditions had bone tissue very similar to their lower-latitude relatives, meaning that the shared physiology of this group permitted them to be successful in the polar environment without requiring any extreme adaptations, such as hibernation. She has remained in contact with her Australian collaborators as she knows there is more to learn about the little polar dinosaurs.

Holly received her PhD in 2012 and moved to a position at the Oklahoma State University Center for Health Sciences. She is currently an Assistant Professor of Anatomy and instructs medical students, has developed a research lab, advises her own postgraduate students, and organises and leads annual field expeditions.

She began a detailed examination of the polar dinosaur bone tissue microstructure, building a descriptive and quantitative dataset. This research led to a recent Scientific Reports publication <https://www.nature.com/articles/s41598-018-19362-6>. The bone



(top) Dr Holly Woodward Ballard; Dr Woodward Ballard with a *Maiasaura* fossil. Photo by Karen Chin

tissue revealed the dinosaurs grew to their wallaby size in five to seven years, and grew most rapidly during their first three years of life. One individual was badly injured, and the bone tissue showed that it had lived with its broken bone, and subsequent infection, for several years before it died.

Holly says her experience in the EAPSI program has had a profound effect on her as a scientist.

'It permitted lasting international collaborative opportunities that I would not otherwise have had, resulting in two publications. I anticipate additional projects with my Australian colleagues in the future.

'Such funding opportunities are crucial for ambitious postgraduate students, preparing them for a professional career by building collaborative scientific networks, promoting critical thinking and problem-solving skills, and providing the research opportunities necessary for early-career publications.'

With a review of the EAPSI program currently underway, the Academy is this year supporting the Australia–Americas PhD Research Internship Program.

Award supports gestational diabetes research

February 15, 2018

The Academy has awarded the 2018 Douglas and Lola Douglas Scholarship to Dr Shamil Cooray for his research on gestational diabetes.

Dr Cooray, a medical doctor and Clinical Fellow of Monash



Dr Shamil Cooray is researching gestational diabetes.

University's Diabetes and Vascular Research Program, was awarded the scholarship to help him complete his PhD.

'I am very grateful to have been selected by the Academy as the 2018 recipient of the Douglas and Lola Douglas Scholarship in Medical Science to supplement my NHMRC Postgraduate Scholarship,' Dr Cooray said.

The scholarship is funded through a bequest from the estate of the late Lola Douglas.

'Miss Douglas was a great philanthropist with a keen interest in medical research and it is an honour to fulfil her wish to support young researchers. I will complete my PhD research program at the Monash Centre for Health Research and Implementation, a partnership between Monash Health and Monash University,' he said.

Dr Cooray's focus will be gestational diabetes, a condition that affects more than 1 in 10 women and that is becoming more common. It

increases the risk of complications to the pregnancy and may also adversely affect the future health of the mother and her children. There has been little prior research into the best system of education and pregnancy care for women with gestational diabetes, and Dr Cooray will work with women to develop an innovative model for pregnancy care that provides individualised guidance to impact health positively.

The Douglas and Lola Douglas Scholarship is offered as a 'top-up' scholarship to a high-ranked PhD candidate awarded a National Health and Medical Research Council Training Scholarship in either Indigenous or primary health care, with preference given to Indigenous health research.

It is awarded initially for one year (currently \$7,000 per annum) with funding available for a maximum of two years. The award covers costs of small items of equipment, research materials, travel, or research assistance.

The scholarship is made possible through a generous bequest made by Lola Rachel Maude Douglas.

More information on the scholarship and previous recipients science.org.au/opportunities/research-funding/douglas-and-lola-douglas-scholarship-medical-science

US professor gives Selby lectures

February 15, 2018

Professor Xi-Cheng Zhang, the M. Parker Givens Professor at the Institute of Optics at the University of Rochester in the US, gave three Selby public lectures in December.

The lectures attracted more than 100 people to RMIT University, the University of Adelaide and the University of Wollongong. According to Professor Zhang there were many intense discussions after the lectures, including talk of Australian researchers planning large-scale terahertz (THz) research activities in 2019, involving many researchers from multiple universities and involving extreme THz science, to which Professor Zhang offered to contribute.

Selby Fellowships are awarded to distinguished overseas scientists to visit scientific centres in Australia. Fellows are expected to increase public awareness of science and

scientific issues. The Fellowship is financed through the generosity of the trustees of the Selby Scientific Foundation.

More information on this award and previous recipients science.org.au/opportunities/travel/travelling-fellowships/selby-fellowship

Conference explores sensitivity of Antarctic ice sheet to marine climate change

February 15, 2018

Changes to the Antarctic ice sheet was the focus of a conference that brought together 30 experts last year in Hobart.

The 2017–18 Elizabeth and Frederick White Conference ‘The sensitivity of the Antarctic Ice Sheet to marine climate change: perspectives from the past’ explored how the Antarctic ice sheet has responded to episodes of climate warming and abrupt climate changes in the past, and what this can tell us about potential future changes.

Local and international scientists studying the Antarctic ice sheet and the surrounding ocean from



(from left) University of Adelaide Dean of Engineering, Professor Anton Middelberg, with Selby Fellowship recipient Professor Xi-Cheng Zhang and Professor Derek Abbott from the University of Adelaide.



Australian and international experts shared knowledge on the Antarctic ice sheet at the 2017–18 Elizabeth and Frederick White Conference in Hobart

modelling and observational perspectives discussed the current state of knowledge, with the conference providing a framework for connecting research expertise and fields.

The main outcome of the event will be a review article on present and past changes in the Antarctic ice sheet, concentrating on the processes and feedbacks between the ocean, cryosphere, solid earth, and sea level. The review article has been invited for submission to 'Reviews of Geophysics'.

The Academy's Elizabeth and Frederick White research Conference Award provides up to \$10,000 for research conferences in the physical and mathematical sciences related to the solid Earth, the terrestrial oceans, Earth's atmosphere, solar-terrestrial science, space sciences and astronomy. The 2018-19 conference is 'Gas-solid reactions in earth sciences and astronomy', and the call for applications to hold the 2019-20 conference will open this month.

Canberra speaker series delves into the Science of Us

February 15, 2018

The Academy's Canberra speaker series for 2018, the Science of Us, is investigating the science of our lives and our health from the moment of conception through to death, focusing on how science is helping to resolve important issues at various life stages.

The first event, When Life Begins, explored what mice, elephants and humans have in common, and

asked can changes to your DNA be passed onto your offspring? The event was sold out, so don't delay booking for future events in the series if you're in Canberra.

Series dates

Put these dates in your diary. We'll also livestream and publish videos of each presentation on YouTube.

- Tuesday 10th April 2018—
Medicine Made for You
- Tuesday 12th June 2018—
When we are Addicted
- Tuesday 14th August 2018—
Your Mental Health
- Tuesday 16th October 2018—
When we Age
- Tuesday 11th December 2018—
When Life Ends

Series convenors

Professor Simon Foote is a molecular geneticist and Director of the John Curtin School of Medical Research at the Australian National University. He is a Fellow of the Australian Academy of Science, the Australian Academy of Technology and Engineering and the Australian Academy of Health and Medical Sciences.

Professor Lois Salamonsen has a PhD in reproductive biology from Monash University and is a Fellow of the Australian Academy of Science. She was Senior Principal NHMRC Research Fellow, Director of the Centre for Reproductive Health at the Hudson Institute for Medical Research, and is adjunct Professor in the Department of Obstetrics and Gynaecology at Monash University. Now partly retired, she heads the Endometrial Remodelling laboratory at the Hudson Institute.

Opportunities for scientists—February 2018

February 15, 2018

Academy awards and funding opportunities now open

Nominations and applications for the Australian Academy of Science's 2019 honorific awards, research conferences, research awards and travelling fellowships are now open.

Find out more about the Academy's opportunities for scientists science.org.au/opportunities

Awards managed by other organisations

In addition to the Academy's opportunities for scientists, there are many opportunities to nominate for prizes and awards managed by other organisations. The following are currently open.

See our full calendar of external awards and prizes science.org.au/opportunities/recognition/external-sources-recognition

TWAS Prizes

The TWAS Prizes are awarded to individual scientists who have been working and living in a developing country for at least 10 years in the fields of agricultural sciences, biology, chemistry, earth, astronomy and space sciences, engineering sciences, mathematics, medical sciences, physics and social sciences—US\$15,000 each.

Closing date: **15 March 2018**

TWAS-Siwel Cheng Prize

The TWAS-Siwel Cheng Prize recognises economic scientists who have been working and living in a developing country for at least 10 years—US\$10,000 each.

Closing date: **15 March 2018**

V. Ambartsumian International Prize

The V. Ambartsumian International Prize is awarded to outstanding scientists who have made a significant contribution in physical-mathematical sciences from any country and nationality—US\$300,000

Closing date: **18 March 2018**

Le Grand Prix de la Fondation de la Maison de la Chimie

The Le Grand Prix de la Fondation de la Maison de la Chimie rewards an original work in chemistry, of benefit to mankind, society or nature—€35,000

Closing date: **30 April 2018**

Australia–China Young Scientists Exchange Program

The Australia–China Young Scientists Exchange Program selects and funds up to 16 Australian researchers to undertake a two-week program of visits in China, 28 October–9 November 2018.

Closing date: **23 March 2018**

Fellows update Honours and Awards to Fellows

February 15, 2018

Australian of the Year awards

Professor Michelle Simmons

FAA—2018 Australian of the Year

Professor Graham Farquhar AO

FAA FRS—2018 Senior Australian of the Year

More on the Australian of the Year awards science.org.au/news-and-events/news-and-media-releases/academy-fellows-win-australian-of-the-year-awards

Australia Day honours

Professor Jennifer Martin AC

FAA—Companion of the Order of Australia (AC) for eminent service to science, and to scientific research, particularly in the field of biochemistry and protein crystallography applied to drug-resistant bacteria, as a role model, and as an advocate for gender equality in science.

Professor Trevor John McDougall AC FAA FRS

—Companion of the Order of Australia (AC) for eminent service to science, and to education, particularly in the area of ocean thermodynamics, as an academic, and researcher, to furthering the understanding of climate science, and as a mentor of young scientists.

Emeritus Professor Lewis Mander AC FAA FRS

—Companion of the Order of Australia (AC) for eminent service to science through pioneering contributions to organic chemistry in the field of plant growth hormones, to higher education as an academic, researcher and author, and to national and international scientific societies.

Professor Ezio Rizzardo AC FAA FRS FTSE

—Companion of the Order of Australia (AC) for eminent service to scientific technological research and development in the field of polymer chemistry, to its application in the biomedical, electronics and nanotechnology context, as an author, and through mentorship roles.

Professor Martin Banwell AO

FAA—Officer of the Order of Australia (AO) for distinguished service to science education as an academic, author and researcher,

particularly in the field of synthetic organic chemistry, to scientific institutes, and as a mentor of emerging scientists.

Emeritus Professor Michael

Barber AO FAA FTSE—Officer of the Order of Australia (AO) for distinguished service to higher education administration, and in the field of mathematical physics, particularly statistical mechanics, as an academic and researcher, and through contributions to science policy reform.

Laureate Professor Scott Sloan

AO FAA FRS FTSE—Officer of the Order of Australia (AO) for distinguished service to education, particularly in the field of geotechnical engineering, as an academic and researcher, to professional associations, and as a mentor of young engineers.

Dr Robin Bedding AM FAA

—Member of the Order of Australia (AM) for significant service to science in the field of entomology as a researcher, and to the forestry industry both nationally and internationally.

Professor Sharad Kumar AM

FAA—Member of the Order of Australia (AM) for significant service to medical research in the field of cancer and cell biology, as a scientist and author, to medical education, and as a mentor.

Dr Hugh (Cecil) Tyndale-Biscoe

AM FAA—Member of the Order of Australia (AM) for significant service to science in the field of marsupial reproductive biology and ecology, as a researcher and mentor, and to professional societies.

More on these Australia Day honours science.org.au/news-and-

events/news-and-media-releases/
fellows-recognised-in-australia-
day-honours

Professor Joss Bland-Hawthorn

FAA—Visiting Miller
Professorship—Astronomy, UC
Berkeley Miller Institute

Professor John Shine AC FAA

Honorary Doctor of Science,
Australian National University, for
outstanding contributions to
biological science

Fellows update Honours and Awards to Corresponding Members

Professor Matthias Hentze

FAA—Honorary Doctor of Science,
Australian National University, for
exceptional contributions to
science

Bertil Andersson FAA

Honorary
Doctor of Science, Australian
National University, for exceptional
contributions to science

Obituary

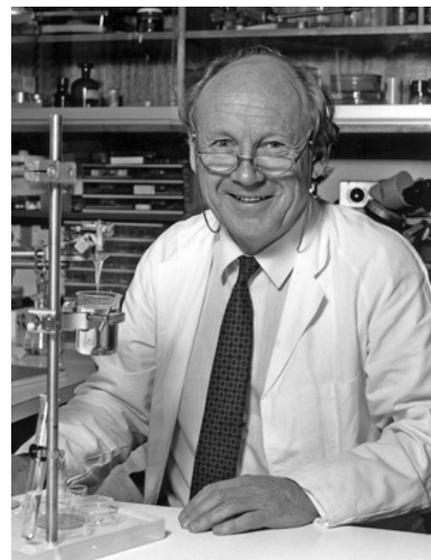
Emeritus Professor David Curtis AC FAA FRACP FRS 1927–2017

Emeritus Professor David Curtis was
the Academy's 11th President,
serving from 1986–1990.

Professor Curtis graduated from the
University of Melbourne in 1950
with Honours in Medicine and in
Obstetrics and Gynaecology and
the degrees of Bachelor of Medicine
and Bachelor of Surgery. After
working at the Royal Melbourne
Hospital for a few years he resolved
to move from clinical neurology or
neurosurgery to laboratory-based
research relevant to neurological
disorders. He took up a position
with Nobel Laureate Sir John Eccles
AC FAA FRS as a Research Scholar at
the John Curtin School of Medical
Research (JCSMR), ANU.

Professor Curtis arrived in Canberra
on 16 February 1954, the day that
Queen Elizabeth founded the
Academy when she presented its
Charter to a number of Petitioners,
which included ten Fellows of the
Royal Society of London then
resident in Australia, including
Eccles (who went on to become the
Academy's second President).

Professor Curtis completed his PhD
on the synaptic transmitters in the
spinal cord in 1956 and at the age
of 38 was elected to the Academy
in 1965 for his work on the
identification and pharmacology of



*Professor Curtis's contributions to the Academy
over several decades were extraordinary.*

central transmitters in mammals. He
was elected to the Royal Society of
London in 1974 and appointed
Director of JCSMR from 1989 to
1992.

Professor Curtis's contributions to
the Academy over several decades
were extraordinary. He served on
numerous committees and was on
the Editorial Board of the Academy's
journal, *Historical Records of
Australian Science* and served as its
Chair from 2002 to 2009. He also
served on the Academy's Council
from 1974 and was Vice-President
from 1974 to 1977. He served again
on the Council from 1986 to 1990,
when he also served as President of
the Academy. Professor Curtis's
active participation in the Academy
continued until just a few years ago.
He was very highly respected within
the Fellowship and will be greatly
missed.