AUSTRALIAN ACADEMY OF SCIENCE

NEWSLETTER

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Science at the Shine Dome 2013

There was energy and enthusiasm to spare when Academy Fellows, early career researchers, teachers and members of the public converged on Canberra on 29–31 May for the Academy's annual gathering, *Science at the Shine Dome*.

On the morning of day one, Academy President Professor Suzanne Cory AC PresAA FRS welcomed a packed auditorium for the formal admission of New Fellows. As always, the presentations that followed the signing of the Charter Book covered a very diverse range of topics. For example, Professor Mathew Brown FAA spoke of genetics and the future of medicine, Professor Bryan Gaensler FAA of cosmic magnetism, Professor Sharad Kumar FAA on cell death, Professor Ian Jackson FAA on seismology, Dr Richard Richards FAA FTSE about meeting the world's future food requirements, and Professor Louise Ryan FAA presented on statistics — the science of uncertainty. That evening early and mid-career researchers (EMCRs) and science teacher attendees mingled with Fellows during a dinner at the Shine Dome.

On day two, Professor Ken Freeman FAA FRS accepted the Academy's highest honour for research in the physical sciences, the 2013 Matthew Flinders Medal, and spoke about his research on dark matter in galaxies (see page 9 for details). The honorific awards continued, with the David Craig Medal for chemistry going to Professor Peter Lay FAA, the Hannan Medal for applied mathematics and computational mathematics to Professor Matthew Wand FAA and the Thomas Ranken Lyle Medal for mathematics to Professor Cheryl Praeger FAA. Throughout the morning, early career researcher awardees spoke of their research in various disciplines. After lunch, during the Academy's Annual General Meeting, EMCRs participated in workshops, while science teachers took part in a program that included a tour of laboratories at the Australian National University (see page 10 for more details).

Photo: Mark Graham

David King addressing the annual symposium, 31 May

Then it was on to the impressive Gandel Hall at the National Gallery of Australia for the annual dinner. Conversations about science filled the gallery, and guests enjoyed a lovely meal along with entertaining anecdotes from the United Kingdom's former Chief Scientific Adviser, Sir David King FRS FAAS, about his time serving under UK Prime Minister Tony Blair, followed by the presentation of the Career Awardees medals.

The theme of this year's symposium was *Power to the people: the science behind the debate*, and a line-up of some of the nation's finest researchers and leaders in the energy sector gave a compelling, sometimes daunting, overview of the sector, including the future of fossil fuels, effects of climate change, the potential of new low-carbon emission technologies, and the environmental, social and political consequences of projected energy shortages.

The technology discussed included solar photovoltaics, geothermal power, nuclear energy, advanced fission technology, power grids and energy storage.

Sir David opened the symposium with a challenging presentation about improving human well-being on a resource-limited planet, including insights into climate change, and future food and energy resources.

The final speaker of the day, Professor Ian Lowe AO FTSE, spoke eloquently about basic solutions to Australia's energy problems, even alluding to the environmentally sound and sustainable benefits of the humble bicycle.

At the close of *Science at the Shine Dome*, it was clear it had been a huge success, with brains full of new ideas and scientists of all ages ready to follow in the footsteps of the Academy Fellows they'd spent time with.

Message from the President

Suzanne Cory

The incredible range and diversity of the science on show through *Science at the Shine Dome* 2013 attested to Australia's continuing rich scientific heritage and vigour — our scientists are remarkable adventurers and pioneers!

It was wonderful indeed to celebrate the outstanding work of our awardees and new Fellows; to catch up on news from old friends and to meet new friends; to welcome enthusiastic and dedicated teachers and early career researchers; and to hear informed and diverse presentations about energy during the symposium — a critical issue for Australia and the world.

Nominations for new Fellows and next year's awards for career and early career researchers are open now: I urge you to put forward your outstanding colleagues (at **www.science.org.au/awards** and **www.science.org.au/fellows/policies-and-procedures.html**)

This year's Annual General Meeting marked the end of term for two of our valued executive committee members — Professor Bob Williamson AO FAA FRS and Professor Mike Dopita AM FAA. I thank them most sincerely for their energetic and insightful contributions as Secretary Science Policy and Treasurer: they have given much to the Academy and their legacies will continue for many years. Welcome to our new Secretary Science Policy, Professor Les Field AM FAA, and Treasurer, Dr Oliver Mayo FAA FTSE.

Thank you also to departing members of Council, Professor Richard Hobbs FAA, Professor Mark von Itzstein FAA and Professor Yu Wing-Mai AM FAA FRS FTSE; and welcome to Professor Peter Koopman FAA, Professor Brian Schmidt FAA FRS Nobel Laureate, Professor Bob Vincent FAA and Professor Jim Williams AM FAA FTSE.

Investing in science for the future

The Australian Government has spoken much of late about supporting Australia's research and science efforts. In the May Budget it heralded the importance of supporting Australian researchers and research facilities to drive innovation and support the growth of high-quality jobs.

The Government announced a $253 million investment in key major research facilities — this was welcome news. But it is a short-term measure and does not provide confidence for the future, particularly in the context of four science ministers over 18 months. What has been provided over the next two years is merely a continuation of survival rations.

In response to the Gonski review, the Government also announced a much-needed injection of $9.8 billion into school education over the next six years, provided the state governments also come on board. The Academy applauds this initiative, but is dismayed that it will be occurring concurrently with $3.3 billion in cuts and deferrals to research and higher education over four years.

In the Academy's view, the 2013 federal science budget lacked vision for the future. Despite the recent plunge in tax revenue, Australia's economy is still strong in global terms. Now is the time to plan for the future; to invest in research and education; to invest in national research infrastructure.

Advocating for science

To ensure that our governments do not lose sight of the importance to Australia of science education and research — now and into the future — the Academy will continue to work hard to advocate for strong and consistent national support for science, and for a new strategic international science collaboration program.

As you will read in this newsletter, recently our work has influenced Australia's satellite utilisation policy, and the nation's approach to searching the deep Earth for future mineral wealth.

We were also delighted that the Governor-General launched our newest book, *Negotiating our future: Living scenarios for Australia 2050*, which examines the complex challenges of environmental sustainability and social equity.

...continues on page 3

Photo: Sandy Spier

NATIONAL PRESS CLUB ADDRESS

Canberra, 11.30 am – 1.30 pm
Wednesday 3 July 2013

Join the President for lunch at the National Press Club as she makes her second nationally televised address on the importance of supporting science for a robust and sustainable society.

Tickets available from **www.npc.org.au/speakers**

Women in science

A more specific challenge is that of retaining young women in the science sector. To help address some of the factors impeding women in science from rising to the top of their profession, the Academy's Australian Early and Mid Career Researcher Forum has developed excellent and much-needed gender equity guidelines, which should be adopted by every science employer and research agency in Australia.

The issue of achieving better gender balance in the Fellowship was discussed at the Academy's AGM; and as we begin another election cycle I enjoin Fellows to be proactive in identifying and nominating outstanding women to be considered for election.

Photo: Mark Graham

Fellows are encouraged to be proactive in identifying and nominating women for election

Science education

Earlier this month we achieved a major milestone in our efforts to support quality science education when we launched the final three units in the *Primary Connections* suite of curriculum resources. These enable the implementation of the national science curriculum from Foundation to Year 6. Development has also recently begun on units for Year 7 where this begins in primary school.

Science by Doing's first fully developed units are being trialled in high schools around Australia: they will soon be launched, and made available online to all Australian secondary schools.

I am pleased to record also that we have recently launched a new topic on *NOVA: Science in the news* – 'Feeding a hot, hungry world – agriculture in the face of climate change', and a new *Interview with Australian scientists*, in which Dr Jim Peacock AC FAA FRS FTSE interviews Dr Cyril Appleby FAA.

This and other Academy video and audio are now available through our YouTube and iTunes channels. If you were unable to join us for *Science at the Shine Dome* this year, I urge you to visit our website or one of our channels and watch or listen to the great range of excellent speakers and science on show.

Professor Suzanne Cory AC PresAA FRS

LINDAU DELEGATES ATTEND *SCIENCE AT THE SHINE DOME*

Eight young Australian researchers selected to go to the 63rd Meeting of Nobel Laureates in Lindau, Germany, in June–July attended this year's *Science at the Shine Dome*. They will join about 500 other students from other nations to meet and talk with Nobel Prize winners in chemistry. Funding for their attendance is provided by the Science and Industry Endowment Fund (SIEF).

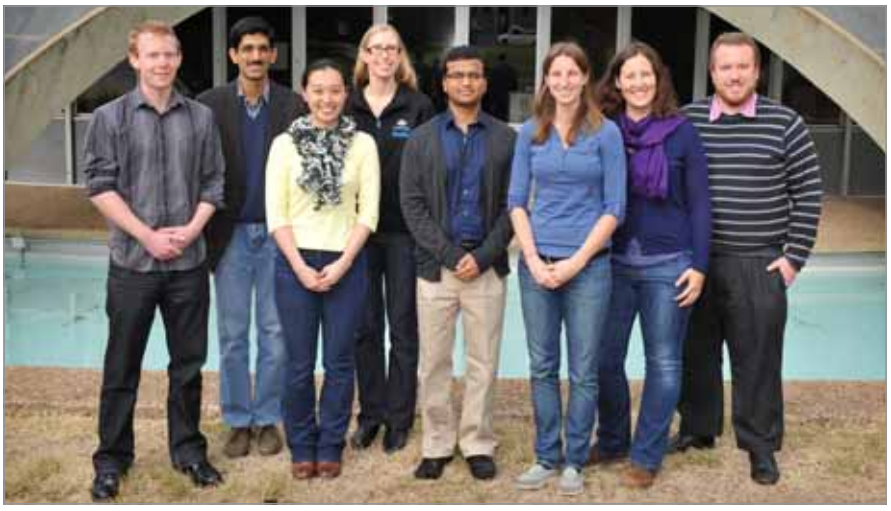


Photo: Mark Graham

L–R: Nick Green, Aditya Chopra, Mandy Leung, Anwen Krause-Heuer, Vipul Agarwal, Lara Malins, Lena Daumann, Paul Stevenson

The students were sponsored by the Academy to participate in this year's Early Career Researchers Program at *Science at the Shine Dome*, attend a pre-Lindau meeting and meet Professor Mark von Itzstein FAA, the leader of the 2013 delegation.

Those selected to go to Lindau are: Vipal Agarwal, University of Western Australia; Aditya Chopra, Australian National University; Lena Daumann, University of Queensland; Nicholas Green, Australian National University; Anwen Krause-Heuer, ANSTO; Hei Man Leung, University of Adelaide; Lara Malins, University of Sydney; Paul Stevenson, Deakin University.

More information can be found at **www.lindau-nobel.org/**

New Fellows

Professor Matthew Brown FAA

Professor Brown has made important contributions to the field of common human disease gene-mapping, playing a significant role in the development of genomewide association studies, a genetic study design which has revolutionised gene-mapping. He is also a leading researcher internationally in musculoskeletal disease genetics, and is a principal investigator in international consortia studying the diseases ankylosing spondylitis, rheumatoid arthritis and osteoporosis. Professor Brown has also made significant discoveries in genetics of rare human diseases, mapping genes responsible for monogenic forms of arthritis, ectopic bone development, and skeletal dysplasias.

Professor David Craik FAA

Professor Craik is a biological chemist who has made important discoveries in the field of structural biology, particularly in the structural elucidation of peptide toxins and proteins having novel topologies. He discovered the cyclotide family of circular knotted proteins and, more generally, has pioneered the field of circular proteins. Circular proteins are characterised by their exceptional stability and Professor Craik's studies have led to their application in drug design and agriculture. His development of an orally active peptide for the treatment of pain is a paradigm-shifting example that has the potential to broadly expand applications of peptides as drugs.

Professor David Day FAA

Professor Day is an acknowledged international leader of research into plant mitochondrial respiration and symbiotic nitrogen fixation. His mitochondrial research, which includes groundbreaking work on the regulation of the alternative oxidase, has provided a model for the integration of carbon metabolism, mitochondrial electron transport and respiratory gene expression in plants. His research on symbiotic membranes in legumes has defined metabolite exchange between nitrogen-fixing bacteria and their plant host. His research is characterised by the integration of physiology, biochemistry and molecular biology that has placed these discoveries in an organism and environment context.

Professor Yuri Estrin FAA

Professor Estrin is one of the world leaders in materials science who has advanced physically based materials modelling in an outstanding way. The models associated with his name have become classic and are broadly used for calculating mechanical behaviour of materials. Professor Estrin's path breaking work in model-driven development of structural nanomaterials and geometry-inspired design of novel materials has also brought him international acclaim. For his contribution to science, he has received numerous international awards, including an Alexander von Humboldt Award (Germany), an honorary doctorate from the Russian Academy of Sciences and a World-Class University professorship from Korea.

Matthew Brown

David Craik

David A Day

Photos: Mark Graham

Yuri Estrin

John Evans

Bryan Gaensler

Professor John Evans FAA

Professor Evans is internationally renowned for elucidating the nitrogen economy of photosynthesis. He has shown how photosynthetic adaptations of species to environmental conditions become quantitatively manifest in the allocation of nitrogen to biochemical processes. Professor Evans has applied these relationships to photosynthetic processes across scales as diverse as chloroplasts, individual leaves and plant canopies. His pivotal work on CO_2 diffusion within leaves forms a basis for process-based models of plant productivity in relation to global change, and the intellectual framework for molecular research aimed at raising crop yields by engineering photosynthesis.

Professor Bryan Gaensler FAA

Professor Gaensler has made fundamental contributions to our understanding of the Universe through his outstanding research on high-energy astrophysics, cosmic magnetic fields and the structure of our Galaxy. His pioneering studies have delivered a unique view on the brightest explosion in history, provided the standard framework for relativistic outflows from neutron stars, revealed the distribution of magnetic fields throughout the Universe, and revised our estimates of the thickness of the Milky Way.

Professor Andrew Hassell FAA

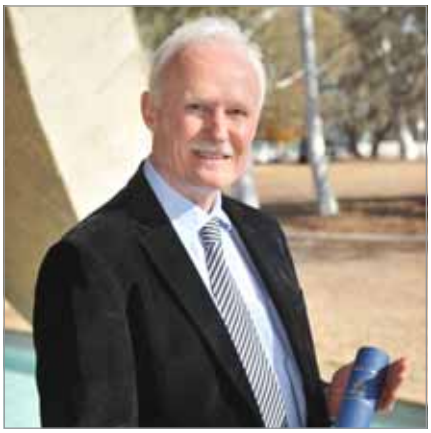
A leading Australian mathematical analyst, Professor Hassell specialises in the spectral theory of partial differential equations and harmonic analysis of manifolds. He has made significant contributions to mathematics in the areas of quantum ergodicity and quantum chaos, analysis on asymptotically conic spaces, time-dependent Schrödinger equations and Strichartz estimates, scattering theory, spectral invariants and numerical analysis. He has aroused considerable international interest by exhibiting examples of planar domains on which the billiard flow is quantum ergodic without being quantum unique ergodic.

Professor Ove Hoegh-Guldberg FAA

During his PhD and early career, Professor Hoegh-Guldberg discovered the molecular mechanism behind coral bleaching. He has pioneered our understanding of endosymbiosis between invertebrates such as reef-building corals and dinoflagellates (*Symbiodinium*), particularly the flow of energy and carbon and its breakdown during ecosystem-level mass-coral bleaching events. Professor Hoegh-Guldberg's discoveries have directly influenced global policy through their integration of the thermal physiology of corals with projections of future sea temperatures, and he was one of the first to demonstrate the extreme sensitivity of ecosystems to increases in anthropogenic CO_2 emphasising the need for a 2°/450 ppm 'guardrail' in climate policy.

Andrew Hassell

Ove Hoegh-Guldberg



Ian Jackson

Photos: Mark Graham

Sharad Kumar

Max Lu

Boris Martinac

Professor Ian Jackson FAA

Professor Jackson's research has been on the physical properties of earth materials and their application in understanding the Earth's interior structure and behaviour. He has developed innovative laboratory studies of seismic properties, with special application to olivine-rich rocks of the Earth's upper mantle. These studies have explored factors that are responsible for seismologically-observed variation in earthquake wave propagation such as frequency, temperature, grain size and partial melting. In parallel, he has contributed to the refinement of theoretical models for thermoelastic and mechanical behaviour in order to provide a robust basis for using the experimental data in elucidating structure and processes in the Earth's deep interior.

Professor Sharad Kumar FAA

Professor Kumar has made path breaking contributions to two areas of fundamental biology: the understanding of programmed cell death, and the regulation of protein homoeostasis. He discovered one of the first mammalian caspases; a novel family of ubiquitin ligases; and a ubiquitin-like protein (Nedd8) involved in a novel protein-modification system now termed Neddylation. Professor Kumar's group discovered and characterised a large part of the *Drosophila* cell death machinery and defined a novel cell death program during development.

Professor Max (Gao Qing) Lu FAA FTSE

A world-leading scientist in materials science and chemical engineering, Professor Lu has made many significant and sustained contributions including the new method for synthesis of highly reactive single crystal TiO_2 and insights into the surface chemistry and modifications of nanoporous materials, molecular engineering of membranes and efficient photocatalysts for clean energy and water. Professor Lu has also demonstrated practical applications of nanomaterials in hydrogen energy and environmental processes with more than 20 international patents.

Professor Boris Martinac FAA

Professor Martinac is a leading membrane biophysicist worldwide: internationally known for his pioneering studies of ion channels in microbes, particularly the discovery, cloning and structural and functional characterisation of mechanosensitive ion channels in bacteria. His discovery of bacterial mechanosensitive channels and elucidation of the basic physical principles of mechanosensitive channel gating by bilayer deformation forces has made major impact in the fields of mechanosensory transduction and ion channels. Professor Martinac's recent work expanded into studies of the role mechanosensitive ion channels may play in neuronal and cardiac diseases.

Professor James Paton FAA

Professor Paton has made major scientific contributions to the field of pathogenesis

James Paton

Richard Richards

Michael Sandiford

Photos: Mark Graham

Geoffrey Taylor

Andrew White

Bryan Williams

and prevention of bacterial infectious diseases, particularly to the human pathogens *Streptococcus pneumoniae* and Shiga toxigenic *Escherichia coli*. Professor Paton's work has established the important role of certain pneumococcal virulence proteins in pathogenesis, and demonstrated their potential as vaccine antigens for prevention of pneumococcal disease, regardless of capsular serotype. Other achievements include characterisation of genes encoding pneumococcal capsule biosynthesis, development of toxin-binding probiotics for prevention of enteric infections, and characterisation of a novel family of bacterial AB_5 cytotoxins.

Dr Richard Richards FAA FTSE

A world leader in the use of physiological traits in the breeding of crop plants, Dr Richards developed an approach that integrates physiological understanding of what determines grain yield in drought-prone environments with the understanding of the molecular and genetic bases of influential physiological traits, now being used widely internationally. Dr Richards' method has enabled a much more effective, targeted use of bioinformatics in breeding crops for such environments, and has resulted in the release of several radically new varieties of wheat.

Professor Michael Sandiford FAA

Professor Sandiford has made important contributions to metamorphic geology, tectonics, earthquake geology, geomorphology and geothermics with a special focus on the young tectonic activity in the Indo-Australian tectonic plate. His work on the thermal structure of the Australian crust has led to the current upsurge of interest in geothermal energy exploration in South Australia.

Professor Geoffrey Taylor FAA

Australian physicists, led by Professor Taylor, made important contributions to the recent discovery of the Higgs boson. Right from the initial idea, Professor Taylor has played a major role in the design and construction of the advanced detectors for the proposed large hadron collider at CERN. The inner tracking component at the heart of the ATLAS detector, designed and built in Melbourne under Professor Taylor's direction is one of the many independent scientific and technical advances which led to the successful outcome at CERN. Professor Taylor's work on ATLAS is just part of his distinguished career in experimental particle physics going back several decades.

Professor Andrew White FAA

Professor White has pioneered world-leading experiments in quantum computation and quantum optics. His research on the first unambiguous demonstration of a quantum-logic gate operation set the standard for all competing quantum-logic gates. Following this major achievement he published the first experimental realisation of the three qubit 'Toffoli' gate and the first experimental demonstration of a quantum chemistry algorithm, and first three-excited state energies of molecular hydrogen. Underpinning these achievements he is also well known for his contributions to modern quantum phenomena such as quantum discord, quantum state and process tomography and optical vortices.

Professor Bryan Williams FAA

Professor Williams is internationally recognised for his work on innate immunity and mechanisms of interferon action. His discoveries include 2'-5' oligoadenylate activated endoribonuclease, cloning and characterisation of protein kinase R, first description of induced gene expression profiles in mammalian cells, and most recently the critical role played by promyleocytic zinc finger protein in innate immunity. Professor Williams has also determined the mechanisms by which cells detect siRNAs and activate an innate immune response. This world-leading work is not only important for understanding defensive responses to viral infections but also has important implications for the use of siRNA in research and therapy.

Professor Stephen Powles FAA FTSE (elected 2012)

Foreseeing that herbicide resistance would become a great problem, Professor Powles pioneered studies of resistance mechanisms. He unravelled several resistance mechanisms, and was the first

Photos: Mark Graham

Stephen Powles

Louise Ryan

to document resistance to glyphosate, the world's most important herbicide. He integrated molecular and agronomic initiatives in Australia, and became the international authority on herbicide resistance. Professor Powles contributes greatly to the management of herbicide resistance and GM crops, and communicates approaches to industry, crop consultants, farmers and scientists worldwide.

Professor Louise Marie Ryan FAA (elected 2012)

An internationally recognised statistician, Professor Ryan is a leading biostatistician who has made important contributions to developing and applying statistical methods in environmental and public health research, including the study of cancer. She has made important methodological contributions in survival analysis and the analysis of correlated multivariate data. Demonstrating leadership in her profession, Professor Ryan is a noted role model and mentor to young statisticians.

New Council members


Leslie Field


Oliver Mayo


Peter Koopman


Brian Schmidt


Robert Vincent


James Williams

In 2013, five new Council members were elected to replace outgoing Secretary Science Policy Professor Robert (Bob) Williamson AO FAA FRS, Treasurer Professor Michael Dopita AM FAA, ordinary members physical sciences Professor Yu Wing Mai AM FAA FRS FTSE and Professor Mark von Itzstein FAA, and ordinary member biological sciences Professor Richard Hobbs FAA.

Professor Brian Schmidt AO FAA FRS Nobel Laureate, who was elected by Council to the position of ordinary member physical sciences as a casual vacancy from the 2012 AGM, was elected to serve on Council for a full term from 2013–16.

Professor Leslie Field AM FAA — *Secretary Science Policy*

Professor Field was elected as a Fellow in 1996 and has previously been an ordinary member physical sciences on Council (2005–07) and worked on the Sectional Committee for Chemistry (1997–2001) and Special Election Committee (2005–11). Professor Field is Deputy Vice-Chancellor (Research) and Professor of Chemistry at the University of New South Wales and his main areas of research are organometallic chemistry, catalysis and NMR spectroscopy. He received the Leighton Medal of the Royal Australian Chemical Institute in 2010.

Dr Oliver Mayo FAA FTSE — *Treasurer*

Dr Mayo was elected as a Fellow in 1996 and has previously served as an ordinary member biological sciences on Council (2008–11). He has been a member of the Finance Committee since 2011 and has served as a director of the Board of the Royal Society (Australia) Pty Ltd, which funds the Academy's Theo Murphy events for young researchers. Dr Mayo was a member and Chair of the Sectional Committee for Agriculture, Veterinary Science and Applied Science from 1996 to April 2013. He also sat on the committee for the JSPS–AAS bilateral researcher exchange program (2012–13), the Australia-India Senior Visiting Fellowships program (2011–12) and is a member of the National Committee for History and Philosophy of Science. Dr Mayo was Chief of the CSIRO Division of Animal Production from 1989 until his retirement in 2000, upon which he was made an honorary research fellow of CSIRO Livestock Industries.

Professor Peter Koopman FAA

Professor Koopman is a new ordinary member in the biological sciences. Elected as a Fellow in 2008, Professor Koopman has taken an active role in the Sectional Committee for Molecular and Cell Biology (2009–12). An ARC Fellow and Professor of Developmental Biology, he is group leader for Molecular Genetics of Mammalian Development at the Institute of Molecular Biosciences, University of Queensland.

Professor Brian Schmidt AO FAA FRS Nobel Laureate

Professor Schmidt was elected as a Fellow in 2008 and is on Council as an ordinary member for physical sciences. He is an ARC Laureate Fellow and Professor at the Research School of Astronomy and Astrophysics, Australian National University. Australia's most recent Nobel Laureate (2011), and recently elected to the Royal Society of London (2012), Professor Schmidt has taken a keen interest in the education programs developed by the Academy. Professor Schmidt is a member of the Academy's National Committee for Astronomy and has interests in cosmology, physics of supernovae and gamma ray bursts, and 'dark energy'.

Professor Robert Vincent FAA

Elected as a Fellow in 2004, Professor Robert (Bob) Vincent holds a Personal Chair and is Head of the Department of Physics, University of Adelaide. Professor Vincent is a new ordinary member in the physical sciences and sat on the Sectional Committee for Physics and Astronomy (2009–12). He is the South Australian Regional Group Chair and has been a member of the National Committee for Space Science (2004–07) and chaired the National Committee for Antarctic Research (2005–08).

Professor James S Williams AM FAA FTSE

Professor James (Jim) Williams is a new ordinary member in the physical sciences. He was elected as a Fellow in 2003 and is Professor, Research School of Physics and Engineering, Australian National University. Professor Williams is the Honorary Editor of this *Newsletter* and has served on the sectional committees for Applied Physical and Engineering Sciences (2011–13) and Information and Communication Sciences (2004–08). He has also assisted with the selection processes for the Japan Society for the Promotion of Science (JSPS) Invitation and Postdoctoral Fellowships (2012–13) and the JSPS-AAS bilateral researcher exchange program (2011–12).

2013 Matthew Flinders Medal and Lecture

The Matthew Flinders Medal and Lecture is the Academy's highest award in the physical sciences, and is presented every second year, alternating with the Macfarlane Burnet Medal and Lecture for the biological sciences. It is awarded in recognition of research of the highest standing in the physical sciences, and honours the contributions of Australia's early scientific researchers.

The 2013 recipient is Professor Ken Freeman FAA FRS, from the Australian National University, who presented a lecture on 'Dark matter in galaxies' during *Science at the Shine Dome* on 30 May.

Professor Freeman was awarded the Matthew Flinders Medal for his work in shaping our current understanding of the dynamics and structure of galaxies. He was among the first to identify the necessity for dark matter in galaxies and has co-established the field of galactic archaeology, in which fossil records of stars are used to trace the formation of the Milky Way. His ideas have helped launch the one billion dollar European satellite Global Astrometric Interferometer for Astrophysics, which will work with a new purpose-built instrument (HERMES) on the Anglo–Australian Telescope to fossick for stars that will chronicle the history of the galaxy since its birth more than 13 billion years ago.

In his lecture, Professor Freeman spoke about the mystery of dark matter, the nature of which remains one of the great problems of contemporary astrophysics. In large galaxies like our Milky Way, only about 5% of the mass is in the form of visible stars and gas. The remaining 95% is made up of dark matter. Although we have known about dark matter in the galaxies since the early 1970s, we still do not know what it is.

Ken Freeman is presented with the Matthew Flinders Medal by Suzanne Cory at the annual dinner

Professor Freeman gave an overview of dark matter in large spirals like the Milky Way, and in the smallest dwarf galaxies formed very early in the life of the Universe, which have dark matter 1000 times denser than the Milky Way.

Depending on the nature of dark matter, there is a faint hope that the dark matter in dwarf galaxies may give off some detectable gamma rays if the dark matter particles annihilate.

For details about the Academy's other 2013 honorific awards for scientific excellence go to: **www.science.org.au/awards/awardees/2013awards.html**

Early and Mid Career Researchers program

Sixty-five early and mid-career researchers (EMCRs) from around Australia participated in *Science at the Shine Dome* this year. The group included eight PhD students and postdoctoral researchers who will be attending the 63rd Nobel Laureate Meeting in Lindau in June/July, and 14 researchers sponsored by their organisations.

The EMCRs mixed with science teachers and Fellows in a relaxed atmosphere during an informal dinner on Wednesday 29 May in the Jaeger Room. The dinner was sponsored by the Bio21 Institute of the University of Melbourne. The Institute's Director Professor Tony Bacic FAA gave a warm welcome followed by an inspiring few words from Secretary Science Policy, Professor Bob Williamson AO FAA FRS.

A workshop on 'Media and communicating science', presented by RiAus Director Dr Paul Willis, took participants on a journey following a very special and rare New Zealand bird, the rowi. Dr Willis talked about what made a good story for the public, how to organise information to keep audiences interested, and how to pitch stories about research for television and other media.

As always 'Grant writing and how to find funding opportunities', was a very popular workshop. 2013 Moran Medal awardee Dr Aurore Delaigle and Fenner Medal awardee Dr Ulrike Mathiesus shared effective strategies for getting research funded, which prompted active discussions and questions from the group.

A third workshop 'Successful scientific collaborations', was presented by 2013 Pawsey Medal awardee Associate Professor Chris Blake and Gottschalk Medal awardee Dr Ben Kile. The group discussed successes and failures in their various collaborations, analysed the situations, and came up with a comprehensive list of tips and pitfalls.

Feedback from EMCRs was extremely positive about the breadth, scope and quality of the presentations by awardees, new Fellows and symposium speakers.

Photo: Mark Graham

EMCRs at this year's *Science at the Shine Dome*

WOW!

Science teachers and educators from all states and territories were hosted by the Academy during *Science at the Shine Dome*, giving them a unique opportunity to mingle with Fellows and other researchers and hear about their latest research.

The group included awardees from the Academy's WOW competition, which encouraged teachers to share an exciting science 'hands-on' activity. Winners included activities about whale sharks, and making concrete beams with reinforcing rods. The judges were most impressed with a spaghetti team from Victoria: their entry can be viewed at **www.youtube.com/watch?v=AbebSZwXtRM**

The teachers also experienced a WOW program coordinated by Dr Kerrie Wilde from the *Science by Doing* team:

- Hands on WOW — engaging kids in the classroom with Anita Trenwith (recipient of the 2012 Prime Minister's Prize for secondary teaching)
- WOW tour — lasers and the coolest matter in the universe, Bose Einstein Condensate. A visit to physics labs led by researchers Professor Ken Baldwin and Dr Tim Wetherell, editor of *ScienceWise*
- Hands-on WOW — blue ice-cream with Dr Mark Ellison and Craig Stewart from ANU Chemistry, explained the science behind making ice-cream with liquid nitrogen, and other cool experiments
- WOW Tour — 'behind the scenes' tour of the John Curtin School of Medical Research with Dr Madeleine Nicol.

Science Budget focuses on the short term

Federal Treasurer Wayne Swan delivers the 2013 Budget

The Academy was disappointed by the short-sighted nature of the 2013 federal science Budget, which failed to take a long-term approach to securing the nation's future and its economic, social and environmental well-being.

While there were short-term investments in researchers and research infrastructure, these came against a background of a total of $3.3 billion in cuts and deferrals to research and higher education, to help pay for the government's 'Gonski' school education reforms. The Academy President called on both major parties to act boldly and create a strong and strategic vision to secure Australia's future.

ARC Future Fellowships

The Academy welcomed allocation of an additional $135.3 million over five years for the Australian Research Council's (ARC) Future Fellowships program. Up to 150 extra four year fellowships, with an estimated value of up to $211 266 per annum, will be offered to outstanding mid-career researchers to conduct their research in Australia. In addition, each researcher's administering institution will receive up to $50 000 per annum for costs directly related to the future fellow's research including infrastructure, equipment and travel. The Future Fellowships scheme aims to attract and retain the best Australian and international mid-career researchers, who might otherwise choose to work overseas. The scheme supports research in areas of crucial national importance.

NCRIS

Funding of $185.9 million over two years was provided to maintain the operation of big research infrastructure constructed under the National Collaborative Research Infrastructure Scheme (NCRIS) and the Super Science Initiative. Since 2007, the Government has funded $1.3 billion to develop further research capacity and improve innovation and research outcomes. This includes national facilities such as marine research vessels, biotechnology platforms, supercomputing facilities and telescopes.

Research funding

Core funding for the Australian Research Council and the National Health and Medical Research Council was protected and support for crucial research bodies was continued without major changes, including for CSIRO, the Cooperative Research Centres, Geoscience Australia, the Defence Science and Technology Organisation and the Australian Institute of Marine Science.

Geoscience Australia

Geoscience Australia received $114 million over four years to improve understanding of the nation's onshore and offshore research base, partly in response to the Academy's work with the sector following on from the Theo Murphy Think Tank on *Searching the deep Earth: the future of Australian resource discovery and utilisation*.

BUDGET AT A GLANCE

$135.3 million over five years for ARC Future Fellowships

$185.9 million over two years for the NCRIS

$114 million over four years to Geoscience Australia to improve understanding of the nation's onshore and offshore research base

$9.8 billion over six years for schools

$3.3 billion cuts and deferrals over four years to tertiary education and research

No long term investment in research and development (including infrastructure)

No strategic international science program

Academy's election platform to be launched in July

Professor Cory will launch the Academy's 2013 election policy statement during her second nationally televised address at the National Press Club Canberra, on 3 July.

The Academy will propose a five-point program to: address strategic investment in Australian science; improve science and maths teaching in schools; reinvigorate research career structures; support international collaboration, particularly with Asia; and reduce administrative burdens to improve research productivity.

The statement says Australia has been fortunate to have been shielded from much of the global financial crisis but must now invest its wealth, at least to levels of the upper end of OECD averages, to ensure ongoing competitiveness and to meet the economic, social and environmental challenges of the 21st century.

Tickets for Professor Cory's National Press Club address are available here: **www.npc.org.au/speakers/professor-suzanne-cory1.html**

Academy releases gender equity guidelines

Gender equity guidelines have been developed by the EMCR Forum Photo: Kate Hoy

On International Women's Day, 8 March 2013, the Academy's Early Mid Career Researcher Forum released guidelines on 'Gender equity: current issues, best practice and new ideas'.

The document was compiled from the coalface with input from early and mid career researchers who attended the *Science pathways* meeting in September 2012, from personal experiences, and from some great online discussions.

The document neatly summarises important elements of gender equity issues, such as the striking imbalance between relatively equal numbers of male and female graduates, and the much smaller number of females in senior roles. It provides working guidelines and suggestions about how this can be improved.

The document is designed for use in universities, research institutes and laboratories to ensure men and women have equal opportunities to pursue successful careers in science. The Forum hopes the guidelines will set a new standard of professional support for women in science.

Since the document's launch, the Forum has received positive feedback from several research organisations setting up gender equity committees or writing new gender equity policies. Comments include that it has been 'incredibly useful in helping to frame (their) goals for change' and that it is great to 'have the guidelines as a framework to work on'.

The Academy and the Forum hope to see these policies endorsed and supported by our national funding bodies — the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC).

The document can be found at **www.science.org.au/policy/documents/GenderEquityEMCRForum.pdf**

Governor-General launches *Negotiating our Future*

How scientists can help address the complex challenges of environmental sustainability and social equity has been the focus of 'Australia 2050', an Australian Research Council (ARC) funded Learned Academies Special Project.

Negotiating our Future: Living scenarios for Australia to 2050 — a two-volume publication produced during the first phase of the project — was launched by Her Excellency the Governor-General Ms Quentin Bryce AC CVO, on 21 February at the Shine Dome.

Negotiating our Future's first volume contains a series of chapters synthesising discussions held during a five-day residential group workshop held in 2011. Each group used different foci (system resilience, social and cultural perspectives, scenarios for Australian futures, or quantitative models) to consider environmental sustainability and social equity. These vibrant discussions and their synthesis generated an exciting proposal for national foresighting, through development of 'living scenarios', which will be explored further in the second phase of the project.

Her Excellency said: 'We must enact these living scenarios, bring together members of the community at every level: community groups, councils, businesses and government, to engage in this creative and dynamic dialogue…'.

'By drawing on both the natural and the human sciences, our vision is enriched by social and cultural perspectives as well as by models and measurements. All these sciences have something in common: they tell us how the world really behaves. We must always be prepared to adjust our way of thinking in the light of these realities.'

The second volume of *Negotiating our Future* contains pre-workshop papers prepared by attendees and guest authors, including contextual information on key topics for the workshop.

The steering committee, workshop committee and workshop attendees included Fellows from all four Learned Academies and other eminent Australian scientists (physical, biological and social) with internationally recognised expertise in their disciplines and dedication to working in interdisciplinary teams to address complex challenges. The Academy acknowledges the exceptional efforts of the researchers involved in preparing these two volumes and in particular the editors Dr Michael Raupach FAA FTSE (Chair), Professor Tony McMichael AO FTSE, Dr John Finnigan FAA, Professor Lenore Manderson FASSA and Dr Brian Walker FAA FTSE.

Quentin Bryce at the launch of *Negotiating our Future: Living scenarios for Australia to 2050*

The document is available from **www.science.org.au/policy/australia-2050**

Academy President first Australian elected to Japan Academy

Academy President and distinguished cancer researcher Professor Suzanne Cory has become the first Australian to be admitted to The Japan Academy.

Professor Cory visited Japan in March to be formally admitted as one of only 27 Honorary Members.

The Japan Academy acknowledged Professor Cory's work, stating: '[Professor Cory's] devotion to encourage young researchers of the world and Japan has been highly significant and enlightening.'

Professor Cory said she was proud to be the first Honorary Member representing Australia 'amongst a very special group of scientists from all around the world'.

While in Japan, Professor Cory met with The Japan Academy President Dr Masaaki Kubo and other senior members of The Japan Academy, to discuss bilateral relationships.

Professor Cory also met with senior science and diplomatic officials at the Australian Embassy in Tokyo and lectured at the University of Tokyo Medical School, the Kyoto University Graduate School of Medicine/Biostudies and Osaka University during her trip.

The Australian Academy of Science has built collaborative relationships with scientists in Japan over many years, including through an exchange program funded by the Japan Society for the Promotion of Science and postdoctoral and invitation fellowships for Australian researchers to work in Japanese research institutions.

For more honours to Fellows see page 18

Photo: Japan Academy

(L–R) Japan Academy President Masaaki Kubo, Vice President Takashi Sugimura, Yoshihide Kozai and Kunihiko Suzuki meet with Jerry Adams and Suzanne Cory

Securing Australia's place in space

The Australian Academy of Science has applauded the Australian Government's new Satellite Utilisation Policy as an important step in securing the nation's place in space.

In its submission to the policy process, the Academy's National Committee for Space Science advocated for a long term, productive Australian presence in space using world-leading innovative space science and technology, strong education and outreach, and international collaborations.

Committee Chair Professor Russell Boyce joined with Senator the Hon Kate Lundy, Minister Assisting for Industry and Innovation, to launch the policy on 9 April at Mt Stromlo Observatory. Professor Boyce said it built on recent exciting growth in the space science and technology sector and the science community was committed to working with government and industry in the coming months and years to realise our national goals in space.

Academy Secretary Science Policy Professor Bob Williamson AO FAA FRS welcomed the Satellite Utilisation Policy as a framework for government, industry and the science and research communities to work together.

As highlighted in an earlier Academy publication, *An Australian strategic plan for Earth observation from space* (July 2009), Australia is dependent on services delivered from space-based technologies for communications, weather forecasting, minerals prospecting, monitoring climate change and much more.

The Academy's submission to the consultation on Australia's Satellite Utilisation Policy is available at **www.science.org.au/reports/2012.html**

Photo: Department of Innovation

Russell Boyce (right) explains the technical capacity and innovations of the Scramjet to Kate Lundy (centre), Roger Franzen (left), Matthew Colless and Margaret Harding at Mt Stromlo Observatory

Sounding the Shine Dome

The Shine Dome in Canberra was wired for sound as part of the Canberra International Music Festival 2013. As part of the festival's *Amazing Space* series hundreds of music enthusiasts visited the Dome for two musical performances and insights into the architectural vision of its designer Roy Grounds from his daughter Victoria Grounds (pictured). She spoke of her father's determination and optimism while working on the design and construction of this unique building.

A San Francisco-based performance duo, Paul Dresher and Joel Davel, entertained the crowd, both playing electronically supported instruments. Dresher worked like the archetypal 'mad scientist' on an elongated quadrachord, a large aluminium instrument that looks like a lap guitar designed for a giant.

Following a performance in the Jaeger Room, the audience moved into the Dome's auditorium where Dresher and Davel were joined by other colleagues including Lisa Moore on piano and Karen Bentley Pollick on violin. On the auditorium's balcony were ANU School of Music students with faculty members, saxophone player John Mackey and percussionist Gary France. The space became an auditory delight as the ensemble performed *In C*, described by festival director Christopher Latham as 'perhaps the happiest music ever written'.

Dresher invited the crowd to move around the room and experience the way the Dome's structure complemented the music. It capped off a fantastic afternoon with the Dome revealing yet another one of its magnificent qualities.

Victoria Grounds spoke of her father's determination and optimism when he worked on the Shine Dome

Masterclass with 2011 Nobel Prize winner

Professor Chennupati Jagadish FAA FTSE, Secretary Physical Sciences, hosted an enthusiastic group of early career researchers at the Shine Dome in mid-February for a masterclass with Nobel Laureate Professor Dan Shechtman.

Professor Shechtman told his inspiring story to a fascinated audience. In the 1980s, as a young visiting scientist in the US, he found seemingly impossible non-periodic crystal structures in metal alloys. His discovery subsequently shifted the paradigm in chemistry but convincing his fellow scientists proved difficult. Years of self-belief and perseverance eventually led him to the ultimate recognition. Professor Shechtman was awarded the 2011 Nobel Prize for Chemistry for his discovery of quasicrystals. The Nobel Committee at the Royal Swedish Academy of Sciences said 'his discovery was extremely controversial,' but his work 'eventually forced scientists to reconsider their conception of the very nature of matter'.

Professor Shechtman is a great advocate for technological entrepreneurship, which he teaches at the Israel Institute of Technology (Technion). He spoke about the success of start-up companies in Israel and said entrepreneurship should be taught to young scientists and engineers in Australia too. He encouraged the early career researchers in the audience to 'be curious and become an expert in something you like doing' and 'combine your subject knowledge with business skills' to find the spirit of entrepreneurship and the motivation to create successful high-tech industries in Australia.

Dan Shechtman delivering the Shine Dome masterclass

Primary Connections suite completed

Nobel Laureate Professor Brian Schmidt AO FAA FRS, Secretary Education and Public Awareness Professor Jenny Graves AO FAA and Program Director Shelley Peers announced the completion of the full suite of *Primary Connections: Linking science with literacy* curriculum units, on 10 May at the Shine Dome.

The release of the final three titles completed the full suite of 31 units that will enable the implementation of the *Australian Curriculum: Science* from Foundation to Year 6. This was the culmination of more than eight years of work funded by the Australian Government.

The launch gave the audience the opportunity to hear more about the Academy's world-leading program and its impact on Australian primary school education and scientific literacy.

In conjunction with professional development that enhances teacher competence and confidence, *Primary Connections* is making a significant contribution to high quality science education across Australia.

Brian Schmidt, Shelley Peers, David Atkins and Jenny Graves launching the *Primary Connections* suite

Attendance at the launch by many Academy Fellows and members of the education community was testament to the high regard in which the program is held. Professor Schmidt spoke about his passion for education and Professor Graves thanked all those who had contributed to its development.

'Collaboration with Asia' workshop held in Sydney

The Academy, in partnership with the Association of Academies and Societies of Science in Asia (AASSA) and the InterAcademy Panel (IAP) held a three-day '*Primary Connections* Collaboration with Asia' workshop in Sydney on 25–27 March 2013.

The hands-on workshop showcased the Academy's award winning *Primary Connections: Linking science with literacy* program to 16 international delegates from 11 countries, along with 19 fee-paying Australian participants. Fifteen of the international delegates, who were reviewing the program for their own countries, were provided with scholarships of up to $1250 to assist with travel, accommodation and meals. These were made possible due to funding from UNESCO through the IAP.

Countries (in addition to Australia) represented at the workshop were: Bangladesh, Fiji, India, Indonesia, Malaysia, Mongolia, Nepal, Pakistan, Sri Lanka, Thailand and the Philippines.

Professor Jenny Graves AO FAA, Secretary Education and Public Awareness, attended the workshop and welcomed delegates on behalf of the Academy. As well as positive feedback, several follow-up inquiries have been received.

NEW MINISTERS FOR SCIENCE

The Academy welcomed recent ministerial appointments arising from a Cabinet reshuffle in late March.

The Hon Dr Craig Emerson MP assumed responsibility for the Tertiary Education, Skills, Science and Research portfolio, while Senator The Hon Don Farrell became Minister for Science and Research. The Hon Sharon Bird MP was promoted to Minister for Higher Education and Skills.

The Academy President, Secretary Science Policy Professor Bob Williamson AO FAA FRS and Professor Tanya Monro FAA met with Senator Farrell soon after his elevation to the portfolio, to discuss international collaboration and other key issues for Australian science.

The Hon Chris Bowen MP resigned from the Tertiary Education, Skills, Science and Research portfolio shortly before the reshuffle.

Nova: Science in the news

A new topic has been added to the *Nova: science in the news* collection on the Academy's website. A brief taste follows. For the full article, please see **www.science.org.au/nova/127/127key.html**

Feeding a hot, hungry world — agriculture in the face of climate change

How will we feed the world's population as the planet gets warmer?

In 2010, global agricultural production amounted to more than eight and a half billion tonnes of grains, vegetables, meat and other bio-products. Slightly more than eight billion tonnes (that's more than eight trillion kilograms!) of this was food. Despite this staggering number, more than 870 million people in the world are still hungry.

Global food producers need to meet the needs of a continually rising world population. Our agricultural systems must become evermore efficient and produce ever increasing amounts. This is a big ask, and the effects of climate change are going to make it tougher. The increased levels of CO_2 in the Earth's atmosphere, produced mainly by the burning of fossil fuels and changes in land use, are predicted to cause higher average temperatures, altered rainfall patterns, and an increase in extreme weather events.

The complex nature of agricultural systems means there are a number of different variables we must consider when we try to assess how these changes in the Earth's climate system will affect global food production. All aspects of food production will likely be affected, from cows and coffee to crayfish and corn. Although there may be some initial benefits to plant growth from elevated atmospheric CO_2 and increased average temperatures, it is clear that the negatives of heat stress, prolonged dry periods, excessive wet periods and other extreme events will likely outweigh any positive effects. With the recent rise of conservation farming techniques, Australian farmers are leading the way in the development of the innovative adaptation measures needed to feed our future generations.

Climate change will make it tough to meet the needs of a rising world population

PHILLIP LAW STREET, CANBERRA

A street just across the road from the Academy building in the New Acton precinct of Canberra has been named in honour of Dr Phillip Law AC CBE FAA FTSE, the Antarctic explorer, who died in 2010. Dr Law was Director of the Antarctic Division, Department of External Affairs, and Leader of the Australian National Antarctic Research Expeditions (ANARE) during 1949–66. He founded the Mawson, Davis and Casey bases in Antarctica.

Dr Law led expeditions in 1955–66 to relieve ANARE stations and explore the coast in Australian Antarctic Territory. He was Chairman of the Australian National Committee for Antarctic Research 1966–80. In 1987 Law Base was established in the Larsemann Hills near the site where Law first landed in February 1958.

Dr Law was awarded a CBE in 1961 for his substantial contribution to Australian achievement in the Antarctic. In 1975 he was made an Officer of the Order of Australia (AO) and in 1995 received the highest award in the Australian honours system — a Companion of the Order of Australia (AC).

Did you know…

the winner of the international competition for the design of the new Parliament House in Canberra, which turned 25 last month, was announced at the Australian Academy of Science (now the Shine Dome) in June 1980.

The winning design, by New York architects Mitchell/Giurgola, was selected through a two-stage competition conducted by the Parliament House Construction Authority. The authority was established by the Fraser government to construct a new building because the 'provisional Parliament House', originally opened in 1927, was inadequate to accommodate the needs of the parliament. The competition drew 329 entries from 28 countries.

The on-site work was directed by Italian-born architect Romaldo Giurgola, now aged 92, who became an Australian citizen in 2000 and still lives in Canberra.

Photo: *Canberra Times*

Sir Bernard Callinan, chairman of the Parliament House Construction Authority, announces the winner of the design competition at the Academy, June 1980.

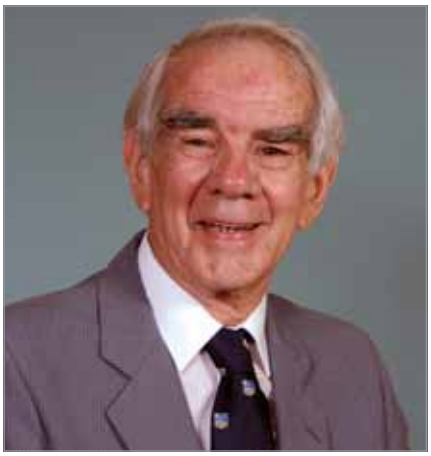
Interviews with Australian Scientists

An interview with Dr Cyril Appleby FAA, otherwise known as 'Dr Plant Haemoglobin', was recently posted on the Academy website at **www.science.org.au/scientists**.

In an interview with Dr Jim Peacock AC FAA FRS FTSE, Dr Appleby discusses a life studying the structure, genetic origin and biological function of plant-kingdom and microbial haemoglobins and cytochromes. He describes how science led him to marry his adored wife Judy and become the proud father of four beautiful daughters, and how a brief bit of 'carelessness' led him to discover a world first.

Dr Appleby's curiosity about the world of science began by watching smoke escape from his neighbour's burning leaves when he was eight years old and living in the seaside country town of Victor Harbor, South Australia. Despite being labeled as a 'precocious' student with a complete lack of sporting finesse, he successfully navigated school, secured a scholarship that allowed him to sit the Leaving Honours Certificate at Adelaide High and — in a final act of defiance towards his much reviled teachers — went on to complete a PhD in yeast biochemistry.

Dr Appleby's research achievements included crystallising the first ever complex cytochrome. He also participated in pioneer work at the Division of Plant Industry at CSIRO, Canberra, which demonstrated that haemoglobins were present throughout the plant kingdom and that plant and animal haemoglobin had a common genetic origin.



Cyril Appleby

Dr Appleby was elected to the Fellowship of the Australian Academy of Science in 1984. He retired from research in 1988 and is now an Honorary Research Fellow at CSIRO.

Awards

Call for 2014 nominations

The Academy has opened the call for 2014 nominations for its prestigious honorific awards for career and early career researchers.

Career awards

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

Early career awards

(for researchers no more than 40 years of age in calendar year of nomination)

- Anton Hales Medal (Earth sciences)
- Dorothy Hill Award (Earth sciences, reef sciences, marine geology and taxonomy)
- Fenner Medal (biology, excluding biomedical sciences)
- Ruth Stephens Gani Medal (human genetics including clinical, molecular, population and epidemiological genetics and cytogenetics)
- Gottschalk Medal (medical sciences)
- Christopher Heyde Medal (probability theory, statistical methodology and their applications)
- Le Fèvre Memorial Prize (chemistry)
- Frederick White Prize (physical, terrestrial and planetary sciences)
- Pawsey Medal (physics)

Nominations are also invited for the 2015 Matthew Flinders Medal and Lecture in the physical sciences. Only Fellows may nominate candidates for this award, but candidates do not need to be Fellows.

The closing date for nominations for these Honorific Awards is 29 July 2013.

The Academy is also opening applications for research grants, travelling fellowships and conference and research support for 2014–15.

The Academy is expecting to administer close to $92 000 in 2014 for the Douglas and Lola Douglas Scholarship in Medical Science and the Margaret Middleton Fund for endangered Australian native vertebrate animals research awards.

Travelling fellowships totalling close to $120 000 are expected to be administered by the Academy for the AK Head Travelling Scholarship for Mathematical Scientists, Graeme James Caughley Travelling Fellowship for ecologists resident in Australia or New Zealand to travel to overseas scientific centres, Oxford Nuffield Medical Fellowship, the Rudi Lemberg Travelling Fellowship for Australians or overseas scientists to visit Australian scientific centres and to deliver lectures, and the Selby Travelling Fellowship for overseas scientists to visit Australian scientific centres.

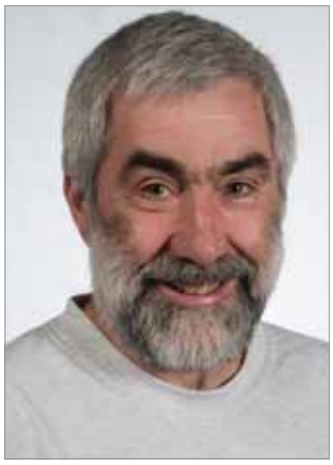
Applications are also invited for 2014 and 2015 research conference support including the Boden Research Conference in the Biological Sciences, the Elizabeth and Frederick White Research Conference in the physical sciences and the Fenner Conference on the Environment. The funding available for these three conferences is up to $30 000 in total.

The closing date for applications for travelling fellowships, and for conference and research support is 31 August 2013.

Further information is available from **www.science.org.au/awards/**

Awards and honours to Fellows





Martin Green, Steve Simpson and Terence Speed have been elected to Fellowship of the Royal Society

Queen's Birthday honours

Professor Graham Farquhar AO FAA FRS was made an Officer in the general division of the Order of Australia for distinguished service to science in the areas of plant physiology and climate change as a leading researcher, academic and author.

Royal Society

Professor Martin Green AM FAA FRS FTSE was elected in recognition of his work in the field of photovoltaics (converting solar energy into direct current electricity), semiconductors, micro-electronics and solar cells.

Professor Stephen Simpson FAA FRS was elected in recognition of his work studying locust swarms to establish a model for nutrition called the 'geometric framework'.

Professor Terence Speed FAA FRS was elected in recognition of his work in bioinformatics, which uses mathematical and statistical strategies to make sense of huge volumes of genomic data, aiding the understanding of gene function and disease.

National Academy of Sciences

Professor Christopher Goodnow FAA FRS was elected as a member in recognition for his work in immunology.

Professor Peter Hall AO FAA FRS was elected as a member for his work specialising in statistics and probability.

Professor Graham Farquhar FAA FRS was elected as a foreign associate for his contributions to environmental sciences and ecology.

Geological Society of London

Professor Kurt Lambeck AO FAA FRS was awarded the Wollaston Medal for his significant achievements in geophysics, geodesy and geology, especially on interactions between the solid Earth and the processes that take place on its surface.

American Association for Cancer Research Academy

Professor Suzanne Cory and **Professor Don Metcalf** were the only Australian researchers among the inaugural induction of Fellows, recognised for their significant contributions to the study of blood and blood cancers.

American Astronomical Society

Professor Ken Freeman FAA FRS was awarded the Henry Norris Russell Lectureship for his lifetime of contributions to astronomy.

Australian Society of Soil Science

Professor Sally Smith FAA was awarded the JA Prescott Medal in recognition of her work in the development and function of mycorrhizal symbioses.

Policy submissions update

Industry Innovation Precincts

In February 2013 the Government released its Industry and Innovation statement, *A plan for Australian jobs*. Part of this statement — the part that gained much media attention — was commitment of $504.5 million to establish 10 Industry and Innovation Precincts and an Industry Collaboration Fund.

Following release of the statement, the Department of Industry, Innovation, Science, Research and Tertiary Education (DIISRTE, now DIICCSRTE) announced consultations on how the precincts and the Industry Collaboration Fund would operate, and is expected to make announcements on precinct areas before September 2013.

Significant funding was committed from the Industry, Innovation and Science budget to fund this scheme. The Academy's submission expressed concerns about the timeframes for applications and outlined ways in which research could be further embedded in the precincts' operations. A copy of the submission can be found at: **www.science.org.au/reports/documents/IndustryInnovationPrecinctsConsultation.pdf**

Strategic review of health and medical research

The final report of the *Strategic review of health and medical research* was released on 5 April 2013. The Academy welcomed the report's release and strongly supported a recommendation for Australia to commit three to four per cent of total federal, state and territory health expenditure to research, an idea put forward by the Academy in its submission to the review. Overall, there was strong alignment between the Academy's recommendations and those appearing in the final report. Copies of the Academy's submissions to the review can be found here: **www.science.org.au/reports/2012.html**

Coming events

10th Asia Oceania Geosciences Society (AOGS) Annual Meeting

Brisbane
24–28 June 2013

Asia-Oceania is particularly vulnerable to natural hazards, accounting for almost 80% of human lives lost globally. The AOGS is deeply involved in addressing hazard related issues through improving understanding of the genesis of hazards through scientific, social and technical approaches. Professor Iver Cairns, former Chair of the National Committee for Space Science, is chair of the local organising committee.

For details go to: **www.asiaoceania.org/aogs2013/public.asp?page=home.htm**

Science in the media

Shine Dome, Canberra
6 pm – 7.30 pm
Tuesday 25 June 2013

Australian Broadcasting Corporation Chair The Hon Jim Spigelman AC QC will give a free public address on the changing place of science in the news media.

Tickets available at **www.eventbrite.com.au/event/6502562339/eorg#**

Jim Spigelman

How electrical stimulation of the brain gives speech understanding to severely deaf people

Shine Dome, Canberra
5.30 pm – 7 pm
Tuesday 2 July 2013

Research by Professor Graeme Clark AC FAA FRS has brought hearing to tens of thousands of people around the world; he led the research that resulted in the first clinically approved bionic ear. His free public lecture will examine the relationship between the technology and the brain, and what it means for severely deaf people.

Tickets available from **www.eventbrite.com.au/event/4962897159**

National Press Club Address

Canberra
11.30 am – 1.30 pm
Wednesday 3 July 2013

Join the President for lunch at the National Press Club as she makes her second nationally televised address on the importance of supporting science for a robust and sustainable society.

Tickets available from **www.npc.org.au/speakers/professor-suzanne-cory1.html**

2013 Elizabeth and Frederick White research conference: *Mathematics of planet Earth*

Melbourne
8 – 12 July 2013

The 2013 conference will bring together the entire scientific community, to cultivate discussions and collaboration. It will draw on the mathematical sciences to solve challenges faced by our planet.

For more details, go to: **www.mathsofplanetearth.org.au/events/2013**

Academy of Technological Sciences and Engineering (ATSE) National Conference *Nuclear energy for Australia?*

Sydney
25–26 July 2013

ATSE is bringing together highly respected international and national speakers — representing the broad spectrum of opinion on nuclear power — to lead open debate in this two-day conference on the key technological, economic, social and environmental issues relating to nuclear power generation.

For more details go to: **www.atse.org.au/content/events/nuclear_energy_content/nuclear_energy_conference.aspx**

1960s Christmas in July

Shine Dome, Canberra
7 pm – late
26 July 2013

Celebrate the Shine Dome's heritage with a traditional 1960s Christmas in July — cocktails, nibbles and swinging 60s dance tunes.

Tickets available at **www.eventbrite.com.au/event/3950622418#**

Mars Invades! Cocktails and sci-fi at the Martian Embassy

Shine Dome, Canberra
7 pm – late
9 August 2013

Come dressed as your favourite 60s sci-fi character or movie artefact; enjoy sci-fi style catering and sci-fi-inspired tunes.

Tickets available at **www.eventbrite.com.au/event/6130024067#**

International news

American students visit

In June the Academy welcomed 20 American graduate students to Australia for the 2013 East Asia and Pacific Summer Institutes (EAPSI) program, jointly funded by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICCSRTE) and the US National Science Foundation (NSF), and co-managed by the Academy and the NSF.

Now in its 9th year, the program enables science and engineering students from a range of disciplines to visit Australia for eight weeks during the American summer to undertake research and build relationships with their Australian counterparts. The students are hosted by various institutions including universities and government organisations. Academy Fellows Professor Marilyn Renfree AO FAA and Professor Bob Williamson AO FAA FRS, and newly elected Fellow Professor David Craik FAA, were among the Australian hosts this year.

An orientation program in Canberra was organised by the Academy, including a series of talks and site visits to cultural institutions as part of the program. Nobel Laureate Professor Brian Schmidt AO FAA FRS spoke informally with participants and provided insight into his experience as an American born researcher working and living in Australia.

Another highlight was a visit to Tidbinbilla Nature Reserve, where the students viewed native animals in their natural habitat and learned about life in Australia before European settlement.

France–Australia Science Innovation Collaboration

Ten early career researchers were awarded Fellowships in the 2013 France–Australia Science Innovation Collaboration (FASIC) grants round. The Fellowships support collaboration with scientists in French research institutions for a minimum of two weeks from 1 July to 31 December 2013. Researchers in any field of 1) medical science and biotechnology; 2) clean energy and resources; 3) climate change and environment; and 4) transport and infrastructure were encouraged to apply.

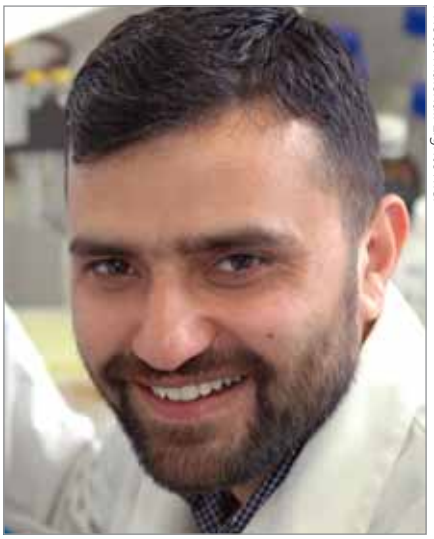


Photo: Marshall Lightowler

Abdul Jabbar

Photo: University of New South Wales

Thomas Sobey

The full list of successful researchers can be found on the Academy's website: **www.science.org.au/internat/europe/index.html**.

Rod Rickards Fellowship

The 2013 recipients of the Rod Rickards Fellowship are Dr Abdul Jabbar from the University of Melbourne and Dr Thomas Sobey from the Centre for Vascular Research at the University of New South Wales. Dr Jabbar will travel to France in November for 19 days to visit Dr Hervé Hoste at the National Institute for Agricultural Research (INRA) to conduct research on novel drugs against parasitic nematodes of major socioeconomic importance.

Dr Sobey will visit Dr Guillaume Romet-Lemonne at the National Centre for Scientific Research (CNRS) in Gif-sur-Yvette in France, in September 2013 for 22 days to undertake research on the 'cyto' skeleton, made of the protein actin, inside the trillions of cells in human bodies.

Collaborative research grants with Germany

On behalf of DIICCSRTE, the Academy invites applications from professional scientists to visit Germany to work on collaborative research projects with German counterparts to facilitate bilateral research under the German–Australian Research Mobility call.

Applications are welcome in the fields of 1) biodiversity: biodiversity genomics; long-term monitoring; current state and trends in biodiversity; and biodiversity informatics, and 2) preventative health: innovative therapies and target identification focused on muscle and liver molecules from basic research to early clinical translation studies; interventional studies related to maternal and child health from preconception to gestational diabetes with a focus on a personalised approach; and tracking the course of high-risk obesity, diabetes and related complications using economic modelling with a view to studying health system interventions.

The deadline for applications is **Friday 26 July 2013**. Further information, including the application form, can be found at: **www.science.org.au/internat/europe/germanymobility.html**.

Grants for international travel to Japan

The Academy invites applications from professional scientists to collaborate with researchers in institutes affiliated with the Japan Society for the Promotion of Science (JSPS) between 1 April 2014 and 31 March 2015, for visits of up to 28 days.

The deadline for applications is **Friday 30 August 2013**. Further information, including the application form, can be found from 1 July 2013 at **www.science.org.au/internat/asia/japan.html**.

News from National Committees

Crystallography

Chair: Emeritus Professor Mitchell Guss

Vale Steve Wilkins (1946–2013)

The passing of Steve Wilkins, an enduring and endearing figure in the crystallographic community, was met with shock and disbelief. He died while doing what he loved best, teaching a new generation of students at Monash University the science of X-rays.

We met in 1970 as PhD students. His PhD was carried out under Professor JM Cowley FAA FRS, working in diffuse scattering from alloys and the role of long-range interactions. During his PhD he worked in the Department of Physics, Arizona State University. He joined CSIRO Division of Chemical Physics in 1975 and was promoted to Chief Research Scientist in 1998. At CSIRO he worked on theoretical problems in X-ray crystallography including quantum effects in the theory of atomic vibrations, the role of asymmetry in the problem of multiple-scattering (also called 'extinction') in structure determination from crystals, and new approaches to the determination of the atomic structure of molecules from structure-factor magnitudes (also called the 'phase problem'). This latter work, on which we collaborated, rested on a powerful and very general branch of statistical inference known as 'information theory', which has the 'maximum entropy' method as a cornerstone. The work helped advance this methodology into the mainstream of crystallography where, when combined with Bayesian methods, it has now become a very powerful technique for the structure determination of macromolecules, particularly in combination with multiple-anomalous scattering data (MAD).

In 1985 Steve made a Japan Society for the Promotion of Science funded visit to explore possibilities for Australian collaboration with the newly established synchrotron in Japan known as the 'Photon Factory'. This led to a formal invitation for Australia to build and operate a beamline at the Photon Factory. Following much lobbying, a multi-purpose powder diffractometer (called 'BigDiff'), conceived by Steve, was built at CSIRO in Clayton. It was installed at the Photon Factory in 1992 as the Australian National Beamline Facility (ANBF), where it has only just been decommissioned and is being shipped to the Australian Synchrotron to go on display. We worked closely on the Australian Synchrotron proposal, lobbying governments and professional societies. He championed the Medical Imaging Beamline and was a driving force behind its development.

A major contribution by Steve and co-workers was in hard X-ray phase-contrast imaging including development of related practical methods and instruments that can use conventional ('polychromatic') X-ray sources. This opened the way for the widespread implementation of hard X-ray phase-contrast imaging in research, and increasingly in industry and medicine. When CSIRO's Preventative Health Flagship began, Steve was the Leader in X-ray imaging and one of his projects for determining the amount of plaque in Alzheimer's brains is still being pursued.

Photo: CSIRO

In SCANZ, our crystallographer's association, and the Academy's National Committee for Crystallography, Steve was a tireless worker. In his quietly efficient way, he organised many meetings for the community, and lobbied to organise the Bragg Centennial in December 2012, in conjunction with the SCANZ and Asian Crystallography Association meetings, an immensely successful event. He organised the *Bragg Centennial Symposium*, inviting several notable crystallographers connected to Sir Lawrence Bragg and members of the Bragg family.

Steve exemplified the quiet achiever and was able to overcome considerable hurdles in seeking the goals he set his eyes on, by a quiet confidence, a sharp intellect and persuasive arguments. He was a scholar and a gentleman and the crystallographic community will miss him.

Steve is survived by his wife Linda, son Simon and daughter Tanya.

Dr Jose Varghese, Member of the National Committee for Crystallography and Chief Research Scientist, CSIRO Materials Sciences and Engineering, Parkville, Victoria

Data in Science

Chair: Dr Rhys Francis

The National Committee for Data in Science (NCDS) aims to promote and facilitate data use in science across all disciplines of science and provide a national voice that can represent Australia at international forums related to that objective. The major topics of discussion over its past few meetings have focused around data and data retention and access infrastructure across the research sector, both nationally and internationally.

Internationally, initiatives now include the longstanding activities of the Committee on Data for Science and Technology (CODATA) and the more recent development of the World Data System (both under the auspices of the International Council for Science), and the very recent development of the Research Data Alliance initiated through support from the USA, Europe and Australia. These initiatives and activities have counterparts nationally, composed of a large number of projects and investments, many of them sponsored through the Australian Government's National Collaborative Research Infrastructure Strategy and Super Science programs. In addition the recently published *National research investment plan* identifies data and research data as a resource vital to the future of science.

The NCDS is working towards a position paper around the best approach for Australian science to benefit from these developments and the best means to harmonise the wide range of activities and efforts that are all seeking to make data, and the rapidly expanding volumes of data, more valuable to current and future science. The committee will be holding further discussions over the remainder of the year to progress the development of a paper to be provided to the Academy and would welcome input on the topic.

Earth Sciences

Chair: Professor Sue O'Reilly FAA

10th meeting of the Asia Oceania Geosciences Society

The Asia Oceania Geosciences Society (AOGS) will be holding its 10th annual meeting in Brisbane, 24–28 June 2013. This major Asia-focused geosciences conference is the first AOGS meeting to be held in the southern hemisphere. Council member Professor Mark von Itzstein FAA will represent the Academy and provide an opening address at the meeting. For registrations and more information: **www.asiaoceania.org/aogs2013**.

Mathematical Sciences

Chair: Professor Nalini Joshi FAA

The Project Officer for the Decadal Plan for the Mathematical Sciences, Peter Stacey, has completed his presentations, and his extensive report has been forwarded to all members of the Steering Committee. The official deadline for receiving submissions has passed, but the Executive has been informed of a number of submissions from peak bodies that are still in preparation, so it has undertaken to accept late submissions. More than 40 submissions have been received to date.

The Steering Committee and the National Committee for Mathematical Sciences both met at Ian Potter House on 13 March to discuss progress with the decadal plan. More information about the plan can be found at **www.mathscidecadalplan.org.au**.

Mathematical Sciences Decadal Plan progress meeting, 13 March

Steering Committee: Decadal Plan for the Mathematical Sciences

The Chair of the National Committee, Professor Nalini Joshi FAA, was asked to be the Academy's representative on the Expert Working Group for Project No. 2 on 'STEM — Country Comparisons' as part of the Australian Council of Learned Academies (ACOLA) project 'Securing Australia's Future'. This project is based on the premise that Science, Technology, Engineering and Mathematics (STEM) are pivotal to increasing our nation's productivity. It is charged with examining existing solutions to the STEM skills shortage in comparable countries and to ascertain which, if any, of those solutions could be usefully applied to the formation and maintenance of a STEM skills workforce, and propose a set of options for increasing Australia's productivity and international competitiveness. The timeline for the project is very short and a final report is due shortly.

The Academy, through the National Committee for Mathematical Sciences, has successfully nominated ANU PhD student Adrian Dudek to attend the inaugural Heidelberg Laureate Forum. The Heidelberg forum offers a select group of young researchers from around the world the extraordinary opportunity to meet recipients of the most prestigious prizes for mathematics (Fields Medal and Abel Prize) and computer science (Turing Award). The first Heidelberg Laureate Forum will take place on 22–27 September 2013 and will be held annually thereafter.

Physics

Chair: Professor Hans Bachor AM

The National Committee for Physics met for the first time under the new Chair, Professor Hans Bachor, on 12 April 2013. The focus of the committee for the foreseeable future will be the promotion and implementation of the recent publication, *Physics Decadal Plan 2012-2021: Building on excellence in physics*. For more information on the plan or to download a copy please visit **www.science.org.au/natcoms/nc-physics/decadal-plan.html**.

Space Science

Chair: Professor Russell Boyce

13th *Australian space science conference*

The *Australian space science conference* (ASSC), 30 September – 2 October 2013, is the primary annual meeting for Australian research relating to space science. It welcomes space scientists, engineers, educators and workers in industry and government. This will be the seventh ASSC jointly sponsored and organised by the Academy's National Committee for Space Science and the National Space Society of Australia, with the support of the Australian Space Research Institute.

Registrations and the call for abstracts are currently open. For more information visit **www.nssa.com.au/ocs/index.php?cf=15**.

New Academy Publications Manager

The Academy has appointed a new Publications Manager, Ms Anne Messenger, an experienced health and science journalist and editor.

Ms Messenger has worked for 20 years as a health writer and editor, most recently as Editor of the national medical publication *Medical Observer*. She has also worked for the Australian Medical Association, the ABC, CSIRO and News Ltd, and as communications and marketing manager for the Australian General Practice Training Program.

Ms Messenger has an Arts degree from the Australian National University, majoring in philosophy and English. She can be contacted at **anne.messenger@science.org.au**

Her appointment follows the resignation of former Publications Manager, Dr Bernadette Hince, for family reasons.

Anne Messenger

Collaborate or commiserate — some thoughts from a Fellow

Academy Fellow Professor Gordon Wallace FAA FTSE, from the ARC Centre of Excellence for Electromaterials Science (ACES) at the University of Wollongong, has taken to YouTube to emphasise the importance of scientists collaborating, both nationally and internationally.

Professor Wallace's online video, which includes an overview of the ACES research project, can be viewed here **www.youtube.com/watch?v=O7Ejasd6qgA&feature=youtu.be** and his online article here: **http://uowresearch.wordpress.com/2013/02/27/collaborate-or-commiserate/**

The Academy welcomes contributions from Fellows on topical issues in science, research and development.

MORE THAN ONE MILLION READ *IMMUNISATION* BOOKLET

The outstanding response to the Academy's *The Science of Immunisation: Questions and answers* booklet continues. The document has now been downloaded more than 1.2 million times since its launch in late 2012.

Hard copy distributions have also been very successful, with nearly 25 000 copies distributed in response to requests from hospitals, GP clinics, schools, daycare centres, pharmacies and many other locations around the country.

The President of the Australian Medical Association (AMA) Dr Steve Hambleton has been a strong public advocate for the publication. With the assistance of the AMA, copies have been sent to all its GP members. In addition, the Pharmacy Guild has distributed copies to all its members, and the Australian Medicare Local Alliance is using the booklet in a variety of ways to support immunisation providers.

For more information or to download the booklet go to: **www.science.org.au/policy/immunisation.html**

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