Australian Academy of Science

AUSTRALIAN ACADEMY OF SCIENCE

ANNUAL REPORT 2010–11

For the period 1 April 2010 – 31 March 2011

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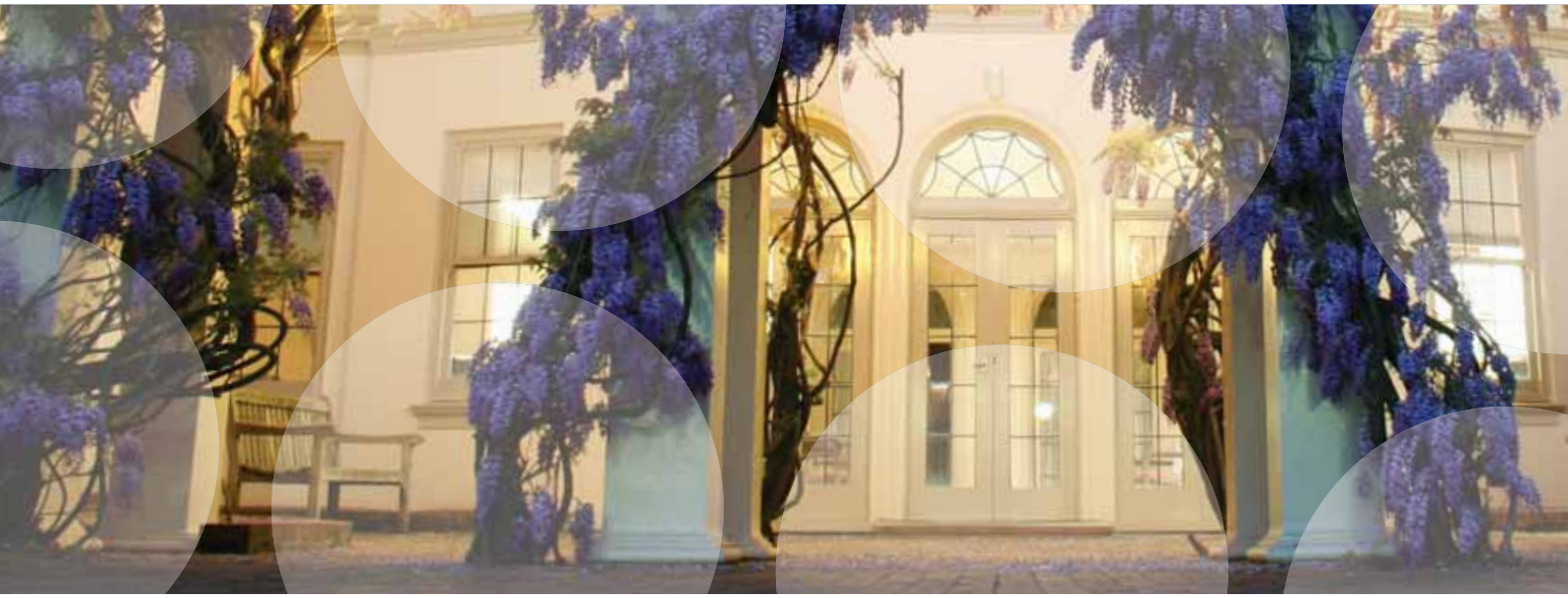

President's foreword

'THE POTENTIAL OF AUSTRALIAN SCIENCE HAS NEVER BEEN GREATER... RESEARCH EXCELLENCE IS A PRECIOUS ENTITY THAT REQUIRES CONSTANT TENDING AND NURTURING. ONGOING INVESTMENT IS REQUIRED.'

My first year as President has given me a much deeper appreciation of both the achievements of the Academy and the challenges it faces in fulfilling its mission.

We rejoice in honouring and welcoming our newest Fellows. Election as a Fellow of the Australian Academy of Science is a signal honour. It also brings significant responsibility and I urge every Fellow to actively participate in our endeavours.

Australia needs to ramp up its investment in science

Australia is fortunate to be rich in natural resources that are in strong demand worldwide: coal, oil, natural gas and minerals. For the foreseeable future, we will continue to benefit economically from the exports derived from our land, but these will not last forever. It is essential, therefore, that a significant proportion of the wealth being generated from our natural resources should be invested in education, research and technology. Australia's future productivity will depend on our ability to innovate. If we support our best research and train our young people so they can take up skilled jobs, then Australia can become the knowledge-based, economically competitive and intellectually vibrant country that it aspires to be.

The potential of Australian science has never been greater. The Australian Research Council's recent *Excellence in research for Australia* initiative, which collected data on 157 disciplines across all Australian universities found that many reach the highest international benchmarks. However, past success and policies are no guarantee that Australia will continue to deliver. Research excellence is a precious entity that requires constant tending and nurturing. Ongoing investment is required.

The US and the UK, both of which have suffered far more from the global financial crisis than Australia, have maintained or increased their commitment to science funding. As Barack Obama so eloquently put it,

> …there are those who say we cannot afford to invest in science, that support for research is somehow a luxury…I fundamentally disagree. Science is more essential for our prosperity, our security, our health, our environment and our quality of life than it has ever been before.

Many big challenges loom for Australia in the 21st century – in health, energy, water, adaptation to climate change, sustainable agriculture and preservation of biodiversity. To tackle these challenges, we need creative scientists, engineers and mathematicians, and a technologically skilled workforce. We need leaders and policy makers who are scientifically well-informed. We need a scientifically literate community.

Providing scientific advice to policy makers

Over the last 12 months, the Academy has made submissions to a range of inquiries and reviews, and completed several major reports relevant to government policy development drawing on the extraordinary expertise of Fellows and their colleagues.

The *2010–2019 Decadal plan for Australian space science – building a national presence in space* identifies a range of goals that would build our capability to look beyond planetary boundaries, and the proceedings of the 2010 Theo Murphy High Flyers Think Tank, *Searching the deep Earth: the future of Australian resource discovery and utilisation*, recommends ways to enable deep exploration in our ancient, deeply weathered continent.

To live within Earth's limits: an Australian plan to develop a science of the whole Earth system argues that a new integrative science needs to be developed to discover the Earth's biophysical limits and determine how to live sustainably within them.

Our booklet *The science of climate change: questions and answers* has injected a much needed voice of reason into the often fraught public debate, by providing an expert summary of current scientific knowledge about climate change, written in an accessible style and providing access to key scientific papers.

Fostering international science linkages

Internationally the Academy's links and standing remain strong. The newest of these was established only this year with the signing of a memorandum of understanding with the Mongolian Academy of Sciences. 2010 marked 30 years of scientific cooperation between Australia and China that were celebrated with a science week event at Shanghai Expo 2010 in August and a visit by a delegation from the Chinese Academy of Sciences led by its President, Professor Yongxiang Lu FAA, in November. The latter included a bilateral workshop on *Agriculture and food security relating to health* – the seventh in a series that has identified opportunities for collaboration in areas of mutual research interest.

All of these events – along with bilateral workshops with Indonesia and Singapore, and support for scientific visits and exchanges that identified collaborative research opportunities and helped Australian researchers build networks in Europe, the Americas and Asia – were supported by the Australian Government's International Science Linkages (ISL) program. The funding for this program, which has been provided through the Department of Innovation, Industry, Science and Research (DIISR), will come to an end in June 2011.

A review has documented its considerable success in increasing Australia's access to global science and increasing awareness of the quality and capabilities of our researchers overseas. We await with great interest the Government's decision regarding ISL's successor in this critical area of government policy.

The Academy's founding Fellows were Fellows of the Royal Society of London and we were pleased to be part of a worldwide program of events to celebrate its 350th anniversary. With support from the Society's Theo Murphy Fund, a Frontiers of Science meeting in Perth brought together 60 early and mid career researchers from the UK and Australia to discuss cutting-edge marine science. In addition, the Academy worked with the Royal Society and the National Museum of Australia to mount *Exploration and endeavour*, an exhibition that illustrated the contribution of science to the evolution of modern Australia, from initial

exploration through to understanding the impact of climate change on the Great Barrier Reef.

Fostering science education

The Academy has long been deeply committed to advancing science teaching in Australian schools. A disturbing result from the 2009 international survey of scientific literacy of 15 year olds is that Australia has flatlined and several other countries have overtaken us, including China, Singapore and Korea.

The Academy's programs *Primary Connections* and *Science by Doing*, were established with strong support from the Australian Government in response to concerns about the quality of science education in schools. Both programs emphasise learning by doing and provide a way for the new national science curriculum to be successfully implemented. The outstanding feedback from teachers and demonstrable benefits to students has attracted considerable national and international interest. We were therefore deeply disturbed when the Government recently signalled that funding would not continue for these programs and are working hard to find a way through the current impasse.

Promoting scientific understanding

Our public lectures have attracted keen interest from the wider community and are available more broadly from our website, along with *Nova: Science in the news* topics which continue to be the most frequently accessed pages.

The 2010 series on *Water management options for urban and rural Australia* resonated strongly as the nation wrestled with widespread drought and extraordinarily extensive floods. The 2011 series, dedicated to Professor Frank Fenner AC FAA FRS, will showcase the latest scientific advances in research areas that he pioneered.

Vale

In November we farewelled not only Frank Fenner, one of our first elected Fellows, but also 10 other Fellows: Professor Athel Beckwith AO FAA FRS, Professor Gavin Brown AO FAA FRSN CorrFRSE, Professor Keith Cole FAA, Professor Graeme Ellis AO FAA, Professor Mollie Holman AO FAA, Professor Lawrie Lyons FAA, Professor John Sprent CBE FAA, Dr Wes Whitten FAA, Professor Hugh Womersley FAA. Each made outstanding contributions to Australian science and to the Academy – they will not be forgotten.

In appreciation

The Academy's activities depend on the contributions of many talented individuals in the Council, Fellowship and Secretariat. I thank them all for their service and commitment and, in particular, our tireless Chief Executive, Dr Sue Meek. I would also like to express my deep gratitude to the outgoing Secretary for Biological Sciences, Professor Graham Farquhar FAA FRS and Council members Professor Doug Hilton FAA FTSE and Dr Oliver Mayo FAA FTSE for their contributions over the last four years. We also welcome Professor Marilyn Renfree FAA as the new Secretary for Biological Sciences and Professor Steve Simpson FAA and Dr TJ Higgins FAA FTSE to Council.

Suzanne Cory AC PresAA FRS

Chief Executive's foreword

'THE ACADEMY SECRETARIAT CONTINUED TO PROVIDE SEAMLESS AND DEDICATED SUPPORT TO THE FELLOWSHIP...'

The Secretariat achieved great results across all operational areas this year despite huge dislocation during the refurbishment of the ground floor of Ian Potter House. The Business Management team performed a sterling job managing the project that arose from the need to replace the carpet which was decidedly threadbare after 25 years of wear and tear!

As is clearly demonstrated by the volume and quality of work outlined in this annual report, the Academy Secretariat continued to provide seamless and dedicated support to the Fellowship, with no discernible impact on productivity or performance.

I thank the House Committee for overseeing the refurbishment process, and also for their proactive role in conveying the Academy's concerns regarding the impact the scale of the proposed Nishi Building across Edinburgh Avenue would have on the heritage values of the Dome. Eminent Canberra architect, Roger Pegrum, provided valuable expert assistance in this regard, and so was an appropriate choice to launch *A big, bold, simple concept: a history of the Australian Academy of Science dome*, by Alan Roberts, commissioned to celebrate the 50th anniversary of its opening.

Regrettably, the development was approved unchanged and is now under construction. A selection of native trees will be planted on the re-engineered mound at the rear of the Dome to provide screening.

Other important maintenance has been necessary for business continuity and the conservation and upkeep of our historic, heritage listed buildings. This included the installation of a new server to update and increase the Academy's IT capabilities, storage and security; custom built vents to manage dampness under Ian Potter House; and an automatic drainage system in the basement of the Dome to protect the archives from possible flooding.

The tribute symposium that began the 2011 public lecture series, *Fenner's science today and tomorrow*,

in February marked the first time an event has been streamed live from the Dome. Web streaming and subsequently posting recorded versions of streamed presentations on the Academy website, will make our public lectures and other Academy events available to much larger audiences.

The Basser Library collections continue to be accessed, either in person or electronically, by researchers interested in the history of Australian science. This year visitors have come from almost every state and territory in Australia, as well as the USA. The monograph collection was made available through the National Library's Trove website in December 2010.

This year we farewelled and were pleased to welcome quite a number of staff. At the management level, Ben Patterson and Dr Kate List have been appointed to replace Business Manager, Phil Greenwood, and Publications Manager, Dr Sharon Abrahams, and Kylie Walker joined us as Director Communications and Outreach.

Sue Meek FTSE

Council and administration

THE AUSTRALIAN ACADEMY OF SCIENCE'S AFFAIRS ARE CONDUCTED BY A COUNCIL OF 17 FELLOWS THAT MET FIVE TIMES BETWEEN 1 APRIL 2010 AND 31 MARCH 2011. TO ENSURE THAT ACADEMY BUSINESS WAS MANAGED EFFECTIVELY BETWEEN COUNCIL MEETINGS, THE EXECUTIVE COMMITTEE, WHICH HAS DELEGATED AUTHORITY, MET 10 TIMES DURING THE REPORTING PERIOD.

Executive Committee

Professor Suzanne Cory AC FAA FRS – President. Professor, Molecular Genetics of Cancer Division, Walter and Eliza Hall Institute of Medical Research

Professor Peter Hall FAA FRS CorrFRSE – Vice President and Secretary for Physical Sciences. ARC Federation Fellow and Professor, Department of Mathematics and Statistics, University of Melbourne

Professor Graham Farquhar FAA FRS[11] **– Secretary for Biological Sciences**. Professor of Environmental Biology and Associate Director, Research School of Biological Sciences, Australian National University

Professor Bob Williamson AO FAA FRS – Secretary for Science Policy. Honorary Senior Principal Fellow and Professor, Faculty of Medicine, University of Melbourne

Professor Andrew Holmes AM FAA FRS FTSE – Foreign Secretary. Laureate Professor, School of Chemistry, Bio21 Institute, University of Melbourne and CSIRO Fellow, CSIRO Molecular and Health Technologies

Professor Jennifer Graves AO FAA – Secretary for Education and Public Awareness. Director, Australian Research Council Centre for Kangaroo Genomics. Head, Comparative Genomics Research Group, Research School of Biological Sciences, Australian National University

Professor Mike Dopita FAA – Treasurer. Emeritus Professor, Research School of Astronomy and Astrophysics, Australian National University

Council members

Physical sciences

Professor Andy Gleadow FAA FGSAust – Professor of Earth Sciences, School of Earth Sciences, University of Melbourne

Professor Chennupati Jagadish FAA FTSE – ARC Federation Fellow and Distinguished Professor, Department of Electronic Materials Engineering, Research School of Physics and Engineering, Australian National University

Professor Yiu-Wing Mai AM FAA FRS FTSE – University Chair, Professor in Mechanical

Engineering and Director, Centre for Advanced Materials Technology, School of Aerospace, Mechanical and Mechatronic Engineering, University of Sydney

Professor Michelle Simmons FAA – ARC Federation Fellow and Professor, Centre for Quantum Computer Technology, University of New South Wales

Professor Mark von Itzstein FAA – ARC Federation Fellow, Professor and Director, Institute for Glycomics, Griffith University

Biological sciences

Professor Chris Goodnow FAA FRS – ARC Federation Fellow and Chief Scientific Officer, Australian Phenomics Facility, John Curtin School of Medical Research, Australian National University

Professor Doug Hilton FAA FTSE[11] – Principal Research Fellow, Walter and Eliza Hall Institute of Medical Research, Melbourne

Professor Richard Hobbs FAA – ARC Australian Laureate, School of Plant Biology, University of Western Australia

Dr Oliver Mayo FAA FTSE[11] – Honorary Research Fellow, CSIRO Livestock Industries, South Australia

Professor Hugh Possingham FAA – ARC Federation Fellow, Professor and Director, The Ecology Centre, University of Queensland

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11 to retire at AGM 2011

Strategic plan: 2010–15

THIS ANNUAL REPORT DESCRIBES THE ACTIVITIES OF THE ACADEMY FROM 1 APRIL 2010 TO 31 MARCH 2011 TO MEET THE OBJECTIVES OUTLINED IN THE 2010–15 STRATEGIC PLAN.

Vision

The vision of the Academy, as Australia's primary representative of natural and applied science, is:

Excellence in Australian science

Mission

The Academy's mission is to:

Champion Australian scientific excellence, to promote and disseminate scientific knowledge, and to provide independent scientific advice, for the benefit of Australia and the world

Objectives

Promote excellence in scientific research nationally and internationally, by:

1. identifying priority areas of research, training and infrastructure support for discipline development in conjunction with the national committees for science
2. providing career development and network building opportunities for young researchers
3. promoting support for the best Australian scientific research, including facilitating access to international scientific organisations and programs
4. supporting the promotion of Australian science capabilities internationally and contributing expertise and leadership in regional and global collaborative networks.

Develop and sustain a national scientific culture, by:

5. ensuring that the Academy and the Fellowship are fully representative of the best scientists in Australia and, through competitive awards, promoting community recognition of the contributions of high quality science to health, well-being and national prosperity
6. supporting the teaching of science at all levels (primary, secondary and tertiary), elevating national standards, enhancing teacher competencies and encouraging students' consideration of science and technology-based careers
7. providing forums for discussion and debate, publications and balanced, expert information on scientific issues of national significance and/or community concern.

Provide valued independent scientific advice to assist policy development and program delivery, by:

8. developing networks and alliances with relevant stakeholders to provide conduits for input of insights and expertise on scientific matters
9. providing authoritative advice on matters of research support, education and training, and science application to inform policy development and decision making
10. monitoring scientific developments in Australia and overseas to anticipate and communicate potential impediments and opportunities.

The Fellowship

THE ACADEMY FELLOWSHIP COMPRISES 426 OF AUSTRALIA'S LEADING RESEARCH SCIENTISTS ELECTED FOR THEIR PERSONAL CONTRIBUTIONS TO SCIENCE. FELLOWS OCCUPY SENIOR POSITIONS IN UNIVERSITIES, GOVERNMENT RESEARCH AGENCIES, INDUSTRY, BUSINESS AND MEDIA.

The Fellowship

Ada, GL
Adams, JM
Allen, DG
Anderson, BDO
Anderson, JM
Andrews, TJ
Angus, JA
Angyal, SJ
Antonia, RA
Appleby, CA
Archer, M
Armstrong, BK
Bacic, A
Baddeley, AJ
Badger, MR
Ball, MC
Banwell, MG
Barber, MN
Bartlett, PF
Bartnik, RA
Basten, A
Batterham, RJ
Baxter, RC
Baxter, RJ
Bazhanov, VV
Bedding, RA
Bennett, MA
Bennett, MR
Bergersen, FJ
Berkovic, SF
Bilger, RW
Bishop, PO
Blanden, RV
Blevin, WR
Boardman, NK
Boger, DV
Bond, AM
Borwein, JM
Boswell, RW
Boyden, SV
Boyle, BJ
Brennan, MH
Brent, RP
Bruce, MI
Budd, WF
Burdon, JJ
Burger, HG
Burgess, AW
Burgman, MA
Burke, DJ
Burnstock, G
Campbell, JH
Campbell, KSW
Canty, AJ
Carbone, FR
Carter, JP
Caruso, F
Cavill, GWK
Celermajer, DS
Chalmers, JP
Chappell, BW
Chappell, JMA
Chivas, AR
Choo, KHA
Clarebrough, LM
Clark, GM
Clark, RG
Clarke, AE
Cockburn, A
Cole, ARH
Colless, MM
Colman, PM
Coltheart, M
Compston, W
Cook, DI
Cooper, DA
Cory, S
Costa, M
Costin, AB
Couch, WJ
Cowan, IR
Cowling, MG
Cowman, AF
Cox, GB
Craig, DP
Crompton, RW
Crossley, MJ
Curtis, DR
Dance, IG
Dancer, EN
Dawes, IW
Day, MFC

Day, RH
de Kretser, DM
Delbourgo, R
Dennis, ES
Denton, DA
Dewar, RL
Doddrell, DM
Doherty, PC
Dopita, MA
Dracoulis, GD
Drummond, PD
Dunn, AR
Durrant-Whyte, HF
Easton, CJ
Eastwood, MG
Egan, JB
Ekers, RD
Elliott, WH
Ellis, JG
Esler, MD
Evans, DJ
Evans, LT
Evans, RJ
Ewens, WJ
Faraone, L
Farquhar, GD
Field, LD
Figgis, BN
Finnigan, JJ
Flambaum, VV
Fletcher, NH
Forrester, PJ
Fraser, RDB
Frater, RH
Frazer, IH
Frederiksen, JS
Freeman, KC
Frommer, M
Furness, JB
Gandevia, SC
Gani, JM
Gibbs, AJ
Gilbert, RG
Gleadow, AJW
Goodnow, CC
Goodwin, GC
Graham, RM
Graves, JAM
Green, DH
Green, MA
Grieser, F
Griffiths, RW
Grimshaw, RHJ
Groves, DI
Gu, M
Gunning, BES
Guttmann, AJ
Haddad, PR
Hall, PG
Hall, RM
Hannaford, P
Hardham, AR
Harrison, TM
Hartley, RI
Harvey, RP
Hatch, MD
Healy, TW
Heath, WR
Higgins, TJ
Hill, DJ
Hilton, DJ
Hinde, DJ
Hirst, GDS
Hobbs, BE
Hobbs, RJ
Hoffmann, AA
Holliday, R
Holloway, BW
Holmes, AB
Holt, PG
Hopwood, JJ
Horridge, GA
Hughes, TP
Hume, ID
Hunter, RJ
Hurst, CA
Hush, NS
Hutchinson, JE
Hyde, BG
Hyde, ST
Hynes, MJ
Imberger, J
Israelachvili, JN
Jacobsen, JV
Jagadish, C
James, DE
Jameson, GJ
Jeffrey, SW
Johnstone, BM
Jones, BO
Joshi, N
Kay, BH
Kemp, BE
Kemp, DJ
Kennett, BLN
Kerr, A
Kerr, JFR
Kivshar, Y
Klein, AG
Koopman, PA
Korner, PI
Kotagiri, R
Kuchel, PW
Ladiges, PY
Lamb, TD
Lambeck, K
Lance, JW
Larkins, FP
Lay, PA
Le Couteur, KJ
Lehrer, GI
Letham, DS
Levick, WR
Lindenmayer, DB
Lindoy, LF
Linnane, AW
Lithgow, TJ
Lovering, JF
Lumbers, ER
MacFarlane, DR
Mackay, CR
Mackay, IR
Mai, Y-W
Manchester, RN
Mander, LN
Marcelja, S
Marshall, BJ
Martin, NG
Martin, RL
Martin, TJ
Masters, CL
Mathieson, AM
Mattick, JS
Mayo, O
McCloskey, DI
McComb, AJ
McCormick, PG
McCracken, KG
McCulloch, MT
McDougall, I
McDougall, TJ
McElhinny, MW
McEwan, AD
McFadden, GI
McFadden, PL
McIntosh, AGR
McIntosh, RA
McKay, BD
McKellar, BHJ
McKenzie, JA
McLachlan, EM
McLeod, JG
Melrose, DB
Mendelsohn, FAO
Metcalf, D
Milburn, GJ
Miller, JFAP
Millis, NF
Mills, BY
Mitchell, GF
Moodie, AF
Moore, JB
Moran, W
Morrison, JD
Morton, DC
Mould, JR

Mulvaney, P
Munns, RE
Myers, RH
Napper, DH
Neeman, A
Newton, JO
Nichol, LW
Nicola, NA
Ninham, BW
Norrish, K
Nossal, GJV
Nugent, KA
Oakeshott, JG
Ogilvie, BM
O'Neill, HSC
O'Neill, SL
O'Reilly, SY
Orlowska, ME
Osborne, MR
Osmond, CB
O'Sullivan, J
Paddon-Row, M
Paltridge, GW
Parker, MW
Parton, RG
Passioura, J
Pate, JS
Paterson, MS
Paxinos, G
Peacock, WJ
Pearman, GI
Pegg, DT
Pettigrew, JD
Phan-Thien, N
Pickett-Heaps, JD
Pittard, AJ
Porter, R
Possingham, HP
Poulos, HG
Powell, R
Praeger, CE
Prawer, S
Pressey, RL
Quirk, JP
Radom, L
Ralph, JT
Ralston, J
Randolph, MF
Raupach, MR
Reddel, RR
Redman, SJ
Reeves, PR
Reid, AF
Reimers, JR
Renfree, MB
Rintoul, SR
Ritchie, IM
Rizzardo, E
Robinson, DW
Robson, R
Rogers, C
Rogers, GE
Rogers, LJ
Rubinstein, JH
Runnegar, BN
Sadler, EM
Sambrook, JF
Sara, VR
Schmidt, BP
Seneta, E
Shine, J
Shine, R
Short, RV
Shortman, KD
Shparlinski, I
Simmons, LW
Simmons, MY
Simon, L
Simpson, ER
Simpson, SJ
Slatyer, RO
Sloan, IH
Sloan, SW
Smith, FA
Smith, SE
Smyth, DR
Snyder, AW
Solomon, DH
Speed, TP
Sprent, J
Sridhar, T
Srinivasan, MV
Stalker, RJ
Stanley, FJ
Stanton, RL
Stephenson, DG
Sternhell, S
Stokes, RH
Stone, J
Strasser, A
Street, R
Street, RH
Sullivan, CE
Summons, RE
Sutherland, GR
Sutherland, RL
Swan, JM
Tam, PPL
Tanner, RI
Taylor, SR
Thomas, AW
Thompson, CJ
Tregear, GW
Trudinger, NS
Truswell, EM
Tucker, RS
Turner, JS
Tyerman, SD
Tyndale-Biscoe, CH
Underwood, AJ
Vaux, DL
Veevers, JJ
Vincent, RA
Visscher, PM
Volkas, RR
von Caemmerer, S
von Itzstein, M
Wake, RG
Walker, NA
Wall, GE
Wallace, GG
Wallace, HR
Walter, MR
Wand, MP
Wang, X
Warnaar, SO
Warren, JR
Waterhouse, PM
Watts, RO
Weigold, E
Welsh, AH
Wentrup, C
Westoby, M
White, GK
White, JW
Whitten, MJ
Wild, SB
Williams, JF
Williams, JS
Williams, R
Williamson, RE
Williamson, R
Wintour-Coghlan, EM
Wiseman, HM
Wiskich, JT
Withers, RL
Woodall, R
Zillman, JW

Corresponding members

Andersson, B
Atiyah, M
Attenborough, D
Bjorkman, OE
Blackburn, EH
Boyer, JS
Brooks, RA
Buckingham, AD
Connell, JH
Cornforth, JW
Feldmann, M
Harris, H
Jones, VFR
Krebs, CJ
Lu, Y
May of Oxford, RM
Öquist, FG
Oxburgh, R
Powell, MJD
Raven, PH
Sanger, F
Slater, EC
Tao, T
Zinkernagel, RM

2011 New Fellows

The following scientists were elected to the Fellowship on 3 March 2011:

Professor Robert John Aitken
School of Environmental and Life Sciences, University of Newcastle

Professor Marilyn Ann Anderson
Department of Biochemistry, La Trobe University

Professor David St Clair Black
School of Chemistry, University of New South Wales

Professor Mark Blows
School of Biological Sciences, University of Queensland

Professor Mahananda Dasgupta
Department of Nuclear Physics, Australian National University

Professor Michael Edward Goddard
Agriculture and Food Systems, School of Land and Environment, University of Melbourne

Professor Trevor William Hambley
School of Chemistry, University of Sydney

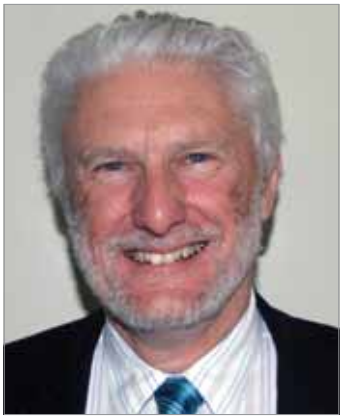

John Aitken


Marilyn Anderson


David Black


Mark Blows


Mahananda Dasgupta


Michael Goddard

Trevor Hambley

Staffan Kjelleberg

Thomas Maschmeyer

Ross McPhedran

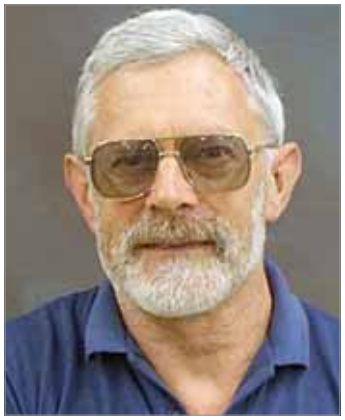
Joseph Monaghan

Ian Petersen

Mathai Varghese

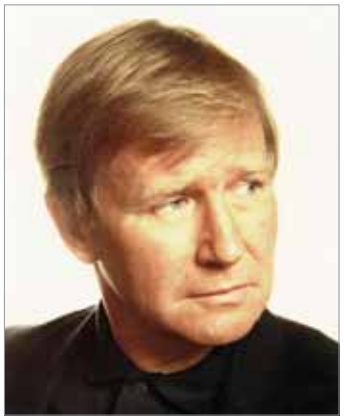
Colin Ward

Emma Whitelaw



George Williams

Aibing Yu



John Dewey

Professor Staffan Kjelleberg
School of Biotechnology and Biomolecular Sciences,Centre for Marine BioInnovation, University of New South Wales

Professor Thomas Maschmeyer
School of Chemistry, University of Sydney

Professor Ross Campbell McPhedra
Centre for Ultrahigh Bandwidth Devices for Optical Systems, School of Physics, University of Sydney

Professor Joseph John Monaghan
School of Mathematical Sciences, Monash University

Professor Ian Richard Petersen
School of Engineering and Information Technology, University of New South Wales, at the Australian Defence Force Academy

Professor Mathai Varghese
Director, Institute for Geometry and its Applications, School of Mathematical Sciences, University of Adelaide

Dr Colin Ward
Walter and Eliza Hall Institute of Medical Research

Professor Emma Whitelaw
Department of Genetics and Population Health, Queensland Institute of Medical Research

Dr George Ellis Williams
School of Earth and Environmental Sciences, University of Adelaide

Professor Aibing Yu
Department of Materials Science and Engineering, University of New South Wales

The Fellowship is listed at **science.org.au/academy/fellowship-list.html**

2011 New Corresponding member

Professor John F Dewey
University College Oxford, UK

Honours awarded to Fellows during the year 2010–11

Professor James Angus

- Officer of the Order of Australia (AO)

Professor Ken Campbell

- The Clarke Medal 2010, Royal Society of New South Wales

Professor Graeme Clark

- The Lister Medal, Royal College of Surgeons of England

Professor Hugh Durrant-Whyte

- NSW Scientist of the Year for 2010
- Elected as a Fellow of the Royal Society of London

Professor Chris Goodnow

- 2010 Ramaciotti Foundations' Medal for Excellence in Biomedical Research

Professor Martin Green

- 2010 Australian Museum Eureka Prize for Leadership in Science

Professor Min Gu

- 2010 ARC Australian Laureate Fellowship

Professor Peter Hall

- 2010 George Szekeres Medal, Australian Mathematical Society
- 2011 Guy Medal in Silver, Royal Statistical Society

Professor Doug Hilton

- Elected as a Fellow of the Australian Academy of Technological Sciences and Engineering

Professor Ary Hoffmann

- 2010 ARC Australian Laureate Fellowship

Professor Chennupati Jagadish

- Quantum Device Award for 2010, 37th International Symposium on Compound Semiconductors
- IEEE Photonics Society 2010 Distinguished Service award

Professor David Lindenmayer

- 2010 Australian Museum Eureka Prize for Environmental Research

Professor Yui-Wing Mai

- Member of the Order of Australia (AM)

Professor Malcolm McCulloch

- Elected as a Fellow of the Royal Society of London

Professor Paul Mulvaney

- 2010 ARC Australian Laureate Fellowship

Professor Amnon Neeman

- 2010 ARC Australian Laureate Fellowship

Dr John O'Sullivan

- Clunies Ross Award 2010

Dr Ezio Rizzardo

- Elected as a Fellow of the Royal Society of London

Professor Bruce Runnegar

- Lapworth Medal 2009, Palaeontological Association

Professor Vicki Sara

- Officer of the Order of Australia (AO)

Professor Stephen Simpson

- Wigglesworth Award for 2012, Royal Entomological Society

Professor Robert Sutherland

- Officer of the Order of Australia (AO)

Professor Mark Westoby

- 2010 ARC Australian Laureate Fellowship

Deaths since 1 April 2010

We regret to record the following deaths:

Professor Athel Beckwith AO FAA FRS,
15 May 2010

Professor Gavin Brown AO FAA FRSN CorrFRSE,
25 December 2010

Professor Keith Cole FAA,
13 December 2010

Professor Graeme Ellis AO DSc FAA,
4 February 2011

Professor Frank Fenner AC CMG MBE FAA,
22 November 2010

Professor Mollie Holman AO FAA,
20 August 2010

Professor Lawrie Lyons FAA,
14 October 2010

Professor John Sprent CBE FAA,
1 November 2010

Dr Wes Whitten FAA,
24 May 2010

Professor Hugh Womersley FAA,
16 January 2011

Science education

THE ACADEMY IS COMMITTED TO PROMOTING SCIENCE EDUCATION, BOTH AS A CONTRIBUTION TO ENHANCING SCIENTIFIC LITERACY AND TO ENCOURAGE YOUNG PEOPLE TO CONSIDER CAREERS BASED ON SCIENCE AND TECHNOLOGY. THE ACADEMY IS ACTIVELY INVOLVED IN CONTRIBUTING TO THE FORMULATION OF POLICY FOR SCIENCE EDUCATION, PREPARING TEACHING RESOURCES FOR PRIMARY AND SECONDARY SCHOOL SCIENCE, AND PROMOTING UNDERSTANDING OF SCIENCE IN THE COMMUNITY. THE FOLLOWING IS AN OVERVIEW OF CURRENT ACTIVITIES.

School science programs

The Academy has two programs to support the effective teaching of science in primary and early secondary schools, known as *Primary Connections: Linking science with literacy* and *Science by Doing*, respectively. State and territory education departments have been integrally involved in the development of these programs since the commencement of *Primary Connections* in 2004 to ensure the programs are consistent with the curriculum requirements of all jurisdictions.

The Australian Government established the Australian Curriculum Assessment and Reporting Authority (ACARA) in May 2009 to develop a national curriculum from kindergarten to year 12 in specified learning areas. In December 2010, the *Australian curriculum: science* – foundation to year 10 – was approved for implementation throughout Australia. The Academy has been directly involved in the development of the curriculum through drafting of the initial framing paper, participating in advisory groups and contributing to consultation processes, as have a number of the Academy's national committees for science. These programs, particularly the well established *Primary Connections*, are being used by education systems to implement the Australian science curriculum.

Primary Connections: linking science with literacy

science.org.au/primaryconnections

PrimaryConnections®
Linking science with literacy

Primary Connections is an innovative national initiative of the Academy which links the teaching of science with the teaching of literacy in Australian primary schools. It comprises a sophisticated professional learning program complemented by rich curriculum resources designed to increase teacher confidence and competence in the teaching of both science and the literacies of science.

Primary school students take a good look at silkworm moths

Professional learning in action

A partnership between the Academy and the Australian Government has resulted in total Government funding of $9.7 million over 2004–11 to develop the project and support its uptake. Under the Government contracts, the project is monitored by a steering committee comprising representatives from the Academy and the Department of Education, Employment and Workplace Relations (DEEWR).

A 21-member national reference group comprising representatives from state and territory education departments, the Catholic and independent school sectors, the Indigenous Education Consultative Body, the Australian Primary Principals Association and the Australian Council of Deans of Education provides advice on the project objectives and the suitability of the project programs for Australian teachers and school systems. The education sectors in several states and territories have now committed significant funds to support quality implementation of the *Primary Connections* approach in their schools.

Appropriate training for teachers in the adoption of the *Primary Connections* approach is essential to obtain the best learning outcomes. This year, the Academy added a comprehensive, three-day master facilitator leadership training course to its professional learning program for teachers. In August 2010, the first cohort of 23 participants were trained as strategic leaders to assist education sectors to implement programs in *Primary Connections*, and to enable them to build the capacity required to conduct the professional learning. All attendees were required to have trained previously as *Primary Connections* professional learning facilitators (PLFs). Trainees were drawn from all three education sectors – government, Catholic and independent – and nominations came from all states and the Northern Territory.

The Academy provides two other professional learning training programs:

- a curriculum leader program, which includes comprehensive training in leadership styles and the project's underpinning principles, designed to prepare teachers to be the science leaders in their schools
- a PLF training program which is designed to prepare facilitators to train teachers across multiple school sites (for example, for a cluster, region or district). These trained facilitators are invited to recall days conducted by the Academy each year.

The professional learning workshops continued to be well attended during 2010–11. Sixty-seven PLFs and 90 curriculum leaders were trained during the year and recall days for PLFs were held in four capital cities. Tertiary facilitators, trained in 2007, were also invited to these days.

The Academy has now trained a total of 677 facilitators, and over 1,350 curriculum leaders. There has been some decline in the number who remain active in the roles due to teachers being promoted, taking leave, retiring and/or relocating, necessitating additional training. Earlier in the project the cost of training was covered by Australian Government funding. However, events are now being funded by the sectors or on a user pays basis.

In 2010, the *Primary Connections* team again provided a half-day training program for 16 Questacon Science Circus presenters to build their awareness of the program and enable them to promote the inquiry-based approach to teaching and learning.

In 2010–11, 10 new curriculum units were developed and trialled by teachers across Australia. Their feedback from the trials will be analysed and incorporated into the units, which will be finalised for publication over the coming year. A key task will be to ensure full alignment with the finalised *Australian curriculum: science*. To maintain maximum support for teachers, the first 19 units that have already been published will be updated gradually for alignment with the national curriculum and republished where necessary (Appendix 1). Proposed timelines for republishing the units and a suggested implementation strategy during the transition are available from the *Primary Connections* website **science.org.au/primaryconnections/**

More than 300,620 curriculum units have been distributed in Australia and overseas since publication began in February 2006, which represents purchases by over 55 per cent of Australian primary schools. This includes 59 per cent of all government schools, 41 per cent of catholic schools and 39 per cent of independent schools. Highest distribution is in South Australia followed by Queensland and Western Australia.

Presentations on *Primary Connections* were made at over 10 national and state conferences and meetings during this reporting period. Project Director Shelley Peers also attended two international conferences, giving a keynote presentation at a conference hosted by the South African Academy of Science and another presentation to the French Academy of Science in May 2010.

Agreement has been reached with a third party supplier, Abacus Pty Ltd, to endorse activity kits of materials produced to support the implementation of *Primary Connections* units.

A Sydney base has been established for the education component of the project in Bondi Junction. This base offers increased possibilities for working closely with New South Wales schools to promote uptake of *Primary Connections*.

The Academy is committed to the ongoing development of *Primary Connections* and is currently exploring all options to ensure its availability in the long term. An interim advisory committee has been formed by the Academy Council to explore the establishment of *Primary Connections* as a self-sustaining not-for-profit enterprise beyond the period of government funding. The committee is chaired by the Education and Public Awareness Secretary.

Science by Doing

science.org.au/sciencebydoing/

Science by Doing is the Academy's national initiative for the improvement of secondary science education. The project aims to improve science learning by engaging secondary students through an inquiry-based approach and supporting school-based learning communities that acknowledge and build upon teacher expertise.

In 2010, the Academy received $2 million to progress stage one of *Science by Doing*.

The approach to the professional learning of teachers

A suite of educational resources has been developed to support the overarching *Science by Doing* professional learning approach (PLA). The PLA recognises that teachers themselves are the key to change. Professional learning requires a continual cycle of reflection, questioning and action. *Science by Doing* supports science department teams within a school to become a professional learning community, sharing knowledge and expertise.

Science by Doing curriculum and professional learning resources

Every member of a professional learning community contributes to improving professional practice and student learning.

The trial

Science by Doing published a trial suite of educational resources in early 2010. A set of five professional learning resources and two curriculum resources were produced and an adaptation manual for existing science resources was also developed. Each resource was developed incorporating innovative digital technologies to enhance learning for all Australian students and teachers.

A trial of these resources was officially launched in Canberra on 7 April 2010 with the opening of a three day workshop by Dr Michele Bruniges, Deputy Secretary Schools, DEEWR. Science coordinators from 28 Australian selected schools representing all states, territories and jurisdictions attended the workshop.

Between April and October 2010, teachers in trial schools used the *Science by Doing* PLA and resources to establish inquiry-based teaching in their classrooms. *Science by Doing* educational specialists travelled throughout Australia to directly support and provide encouragement to school coordinators, principals and faculty staff. During this time, comprehensive feedback and information was collected from all stakeholders to assist evaluation of the project.

The *Science by Doing team* – Melissa Smith, Denis Goodrum and Amelia Druhan

Science coordinators met once again in Canberra on 14 October to reflect upon and discuss the approach and resources and to provide valuable feedback to the team for revision and improvement of *Science by Doing*.

The independent evaluation

An independent evaluation report of the *Science by Doing* trial was produced by Professor Léonie Rennie of Curtin University in November 2010. Among many positive findings, Professor Rennie reported that school coordinators believed constructive change was happening within their science departments because of *Science by Doing*. This report can be accessed from the *Science by Doing* website at **science.org.au/sciencebydoing/research-evaluation/**

As it did for *Primary Connections*, the development of the new Australian Curriculum impacted on *Science by Doing*.

With the release of the new science curriculum on 8 December 2010 *Science by Doing* moved into a revision phase. Based upon feedback and

evaluation, a process of adjusting and improving the curriculum and professional learning resources commenced.

Final versions of all stage one resources are expected to be completed in June 2011.

Spreading the good word

During 2010, the *Science by Doing* team has been working to refine our key messages and promote the project. Regular meetings with DEEWR ensured the team remained connected and aligned with a shared strategic vision. *Science by Doing* also met with state and territory officials, and promoted the project at international events.

In late May 2010, Deputy Director of the program – Amelia Druhan – was selected to attend *La Main á la pâte*, an international seminar on inquiry-based science education in schools held in Paris, France. In October 2010, Project Director Professor Denis Goodrum accepted an invitation to present a plenary session on *Science by Doing* at the Inter-Academy Panel Conference in York, UK. The conference, *Taking IBSE (inquiry-based science education) into secondary education*, provided the opportunity to showcase *Science by Doing*. In late March, Professor Goodrum was invited to speak about *Leading for change* at the prestigious 2011 Australian Council for Education Leaders Curry Lecture at the Australian National University (ANU).

With stage one drawing to a close, attention is now turning to the future. From the solid foundation established by stage one, stage two would involve the development of 15 additional curriculum resources, five professional learning resources and a teacher education program. Further funding of the program is required to enable stage two of the project to progress and support teachers of secondary science to rekindle in young Australians a passion for and engagement with science.

Other educational initiatives

The Academy has two longstanding programs – *Interviews with Australian scientists* and *Nova: Science in the news*, established respectively in 1993 and 1997.

Nova topics examine the science behind topical issues, bringing together widely divergent fields and providing 'real life' examples of current research and how this information can be used to make informed decisions. The *Interviews with Australian scientists* program records the history of Australian science for future generations and provides a human perspective on science.

Although not specifically aligned with school curricula, these programs provide valuable educational resources for use in schools, as well as accessible information on science for interested members of the public.

Nova: Science in the news

science.org.au/nova

Nova: Science in the news continues to rank as the most popular part of the Academy website. *Nova* has undergone extensive redesign and redevelopment during the reporting period to prepare for migration to the new website.

There are currently 124 *Nova* topics available and several more in development. Each topic includes a balanced summary of the main points in non-technical language, boxed case studies or explanations of Australian research and applications, and a glossary of commonly used scientific terms. *Nova* topics also provide links for teachers to relevant student activities, including discussions, practical activities, fieldwork and further reading with links to other high quality, useful sites on the internet. Each *Nova* topic is thoroughly reviewed by specialists in the field, nominated by the Academy. The scientific expertise and extensive research experience of Academy Fellows are the program's greatest resource. Topics are reviewed regularly to ensure that they continue to provide accurate, up-to-date and reliable information for users.

New topics are announced by media release and notification is also sent to schools, state libraries, science education organisations, corresponding Academy Fellows and *Nova*'s subscribers.

Two new *Nova* topics have been launched this year:

Bioinformatics: making sense of the information flood

Since the completion of the Human Genome Project, scientists have been inundated by biological information. The field of bioinformatics is

helping to make sense of it all by drawing together mathematicians, information scientists, biomedical science and biology. This topic describes some of the new bioinformatics tools that are now being used to develop new medical treatments and to make advances in areas such as agriculture and biology.

This topic was sponsored by the Australian Research Council (ARC) Centre of Excellence in Bioinformatics.

Geoengineering – can it help our planet keep its cool?

Geoengineering involves applying technology on a massive scale to change the Earth's environment. It might help to cool the Earth, but what exactly are the costs? This topic includes information about the different types of geoengineering technologies and how they might affect climate change as well as current research directions and some of the legal and ethical aspects associated with using these technologies.

This topic was sponsored by the Department of Climate Change and Energy Efficiency (DCCEE).

Interviews with Australian scientists

science.org.au/scientists

The Academy established the *Interviews with Australian scientists* program in 1993 to record interviews with outstanding Australian scientists. The scientists talk about their early life, development of interest in science, mentors, research work and other aspects of their careers.

In the past year, 20 new transcripts with accompanying teachers' notes were posted to the website (see Table 1).

Fifteen new interviews were filmed during the reporting period, taking the total number to 134 interviews since 1993 (see Table 2).

The Academy acknowledges with gratitude the Fellows and other esteemed scientists who gave generously of their time as interviewers and interviewees for the *Interviews* program, and the generous donations from sponsor organisations.

The transcripts and videos are used by a variety of people and organisations. Over the past 12 months we have had reproduction requests from film-makers, book publishers, writers and students. Some examples of where material has been used includes *Australian women – shaping a nation* on Foxtel's biography channel, *Chemistry in Australia* magazine, *Australians of the year 1960–2010* by

PHOTO: ASSOC. PROF G SHAW, ARC CENTRE OF EXCELLENCE IN KANGAROO GENOMICS, ZOOLOGY DEPT, UNI MELB.

The genome of the tammar wallaby *Macropus eugenii* is providing valuable genetic information.

Table 1		
Australian scientist	**Interviewer**	**Sponsor**
Professor Charles Birch	Professor Rick Shine	University of Sydney
Dr Bill Blevin	Professor Neville Fletcher	National Measurement Institute
Professor Andy Cole	Professor Don Watts*	University of Western Australia
Professor David de Kretser	Sir Gus Nossal	University of Melbourne
Dr Bruce Fraser	Professor George Rogers	Australian Academy of Science
Professor Paul Korner	Professor John Chalmers	Baker IDI Heart and Diabetes Institute
Professor Jim Lance	Professor David Burke	University of New South Wales
Professor John Lovering	Professor Robyn Williams	University of Melbourne Faculty of Science
Professor Barry Marshall	Dr Norman Swan*	University of Western Australia
Dr Oliver Mayo	Professor Robyn Williams	CSIRO Livestock Industries
Professor Jim Morrison	Professor Tony Klein	La Trobe University
Professor John Newton	Professor George Dracoulis	Australian National University
Dr Jim Peacock	Dr Liz Dennis	CSIRO Plant Industry
Professor George Rogers	Dr Bruce Fraser	University of Adelaide
Professor Robin Stokes	Professor Ken Marsh*	University of New England
Dr Robin Warren	Dr Norman Swan*	University of Western Australia
Dr Roy Woodall	Professor Richard Stanton	University of Western Australia
Dr Amanda Barnard*	Dr Cecily Oakley*	Australian Academy of Science
Dr Nicole Webster*	Dr Cecily Oakley*	Australian Academy of Science
Dr Fiona Wood*	Dr Norman Swan*	University of Western Australia

* non-Fellows

Table 2		
Australian scientist	**Interviewer**	**Sponsor**
Dr Bill Blevin	Professor Neville Fletcher	National Measurement Institute
Professor Henry Burger	Professor Rob McLachlan*	Prince Henry's Institute
Professor Andy Cole	Professor Don Watts*	University of Western Australia
Professor Angas Hurst	Professor Bob Crompton	University of Adelaide
Professor Jim Lance	Professor David Burke	University of New South Wales
Professor John Lovering	Professor Robyn Williams	University of Melbourne Faculty of Science
Dr Oliver Mayo	Professor Robyn Williams	CSIRO Livestock Industries
Professor Jim Morrison	Professor Tony Klein	La Trobe University
Professor John Newton	Professor George Dracoulis	Australian National University
Dr Garth Paltridge	Professor Graham Farquhar	Australian Academy of Science
Professor Roger Short	Professor Robyn Williams	University of Melbourne Faculty of Medicine, Dentistry and Health Sciences
Dr Guy White	Professor Neville Fletcher	CSIRO Materials Science and Engineering
Dr Amanda Barnard*	Dr Cecily Oakley*	Australian Academy of Science
Professor Nick Hoogenraad*	Professor David Vaux	La Trobe University
Dr Nicole Webster*	Dr Cecily Oakley*	Australian Academy of Science

* non-Fellows

Professor Neville Fletcher (left) interviewed Dr Guy White (right) about his career in cryogenics and low-temperature physics.

Wendy Lewis and numerous school projects. There is also great potential for *Interviews with Australian scientists* to be used as a resource to support the teaching of the 'science as a human endeavour' strand in the new Australian science curriculum.

Three-minute teaser videos have now been added to the Academy website and are available from science.org.au/news/video/.

Science at the Shine Dome – teachers' program

Eighteen teachers and science educators from around Australia participated in the 2010 Science at the Shine Dome event (see the Public awareness and outreach section of this report for more details). Of these, eight teachers attended the event as recipients of the annual Teacher Award, offered by the Academy, with the ongoing and generous support of Professor David Craig FAA, to enable a teacher from every Australian state and territory to attend the event. Invited guests included the winners of the Prime Minister's Prize for Excellence in Science Teaching in Primary Schools 2009 and the BHP Billiton Science Teacher Award 2009, and the President and CEO of the Australian Science Teachers Association. The other six participants registered and participated in the teachers program at their own expense.

Participants also attended a workshop aligning with the symposium topic *Genomics and mathematics* at CSIRO Discovery Centre, providing hands-on experience in gel electrophoresis followed by group discussions on the use of cutting-edge science and the new Australian science curriculum. Teachers also received genomics resources and information on the Academy's education programs for use in their classrooms.

Science policy

THE ACADEMY'S VISION IS TO PROMOTE EXCELLENCE IN AUSTRALIAN SCIENCE. THIS IS ACHIEVED IN PART THROUGH THE PROVISION OF CONSIDERED SCIENTIFIC ADVICE TO ASSIST GOVERNMENT POLICY DEVELOPMENT AND PROGRAM DELIVERY. AS AN INDEPENDENT BODY OF AUSTRALIA'S TOP RESEARCH SCIENTISTS, THE ACADEMY HAS AUTHORITATIVE EXPERTISE IN MANY AREAS OF SCIENCE AND TECHNOLOGY. IT PROVIDES CAPACITY TO INFORM THE DEVELOPMENT OF EVIDENCE-BASED POLICY DIRECTED AT NATIONAL NEEDS AND CONTRIBUTES TO INTERNATIONAL DEBATE.

Overview

The Academy's *The science of climate change: questions and answers* document made a substantial, expert contribution to informing community debate and public policy formulation. The booklet was released in August to coincide with the 2010 National Science Week. The hundreds of requests received for copies and the thousands of downloads from the website, both in Australia and overseas, confirm this publication delivered on a significant unmet need for clear, balanced information in this complex area.

In a statement on sustainable population in June 2010, the Academy signalled its previous contributions to this contentious subject and an intention to remain engaged. The statement advocated a full analysis of the consequences of population increase for Australia's environment and society. The ARC–Learned Academies Special Project Grant awarded to the Academy for 2010 to 2012, *Australia 2050: achieving an environmentally sustainable and socially equitable way of living*, is intended to address key aspects of how this might be achieved.

A pre-election statement, *Empower science, power the future* released in August set out the Academy's science policy objectives. The statement highlighted that governments around the world recognise that science is vital for economic growth and international competitiveness, and stressed the importance of sustained investment in Australia. While science did not feature strongly in the 2010 Federal election campaign, the key proposals to increase research and development expenditure to 3 per cent of GDP by 2020 and to appoint science advisers to all government departments did generate some media discussion. The Academy also made eight submissions to reviews and Government inquiries on a range of topics including funding for agricultural research and development, infrastructure funding, and proposed amendments to the Patent Act.

Since taking office, the Academy President Professor Suzanne Cory AC PresAA FRS met with a number of relevant government ministers and their representatives. The President is an ex officio member of the Prime Minister's Science, Engineering and Innovation Council (PMSEIC), and a number of Fellows are members of its Expert

Working Groups. At her first meeting of PMSEIC on 4 February 2011, Professor Cory presented a range of significant Academy reports and publications including the climate change booklet and the proceedings of the successful 2010 High Flyers Think Tank on resource discovery. The latter was launched by the Minister for Resources and Energy the Hon Martin Ferguson AM MP.

In partnership with the Federation of Australian Scientific and Technological Societies (FASTS), an online survey was conducted in July to provide a snapshot of general science literacy in the Australian population. Based on a 2009 survey conducted by the California Academy of Sciences in the US, the results of the Australian survey show that most Australians are aware of many basic scientific facts. However, around three in 10 Australians reported their erroneous belief that humans and dinosaurs co-existed! A majority of respondents indicated their view that science education is 'absolutely essential' (42 per cent) or 'very important' (38 per cent) to the Australian economy.

The survey report is available from **www.fasts.org/images/News2010/science literacy Report final 270710.pdf**

A memorandum of understanding was signed in August 2010 with the Defence Science and Technology Organisation (DSTO) to establish a framework through which the Academy and DSTO

Box 1: Academy submissions to Government reviews and inquiries

2010

30 June – Statement: Australian Academy of Science's role in the sustainable population debate

16 July – The Academy's submission to the Productivity Commission Inquiry into the Rural Research and Development Corporations Model said the current model of funding of plant and animal sciences in Australia is sound. It recommended changes in some areas, especially in the area of promoting plant/animal/agricultural science as a career.

10 August – The Academy's 2010 election statement: *Empower science, power the future* set out the Academy's science policy objectives

26 November – In a joint submission to the Productivity Commission's Draft Report *Rural research and development corporations and its recommendations*, the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering and the Australian Council of Deans of Agriculture argued that the report's recommendations did not adequately address the role of rural research and development corporations and their contribution to the overall productivity, sustainability and international competitiveness of primary industries.

3 December – The Academy's response to the ARC's *Discovery program consultation paper* proposed guidelines for a new early career researcher award.

2011

4 February – The Academy's submission to the Government's *Independent review of aid effectiveness* urged an increase in scientists' involvement in overseas aid, and suggested the appointment of a Chief Scientific Advisor to AusAID.

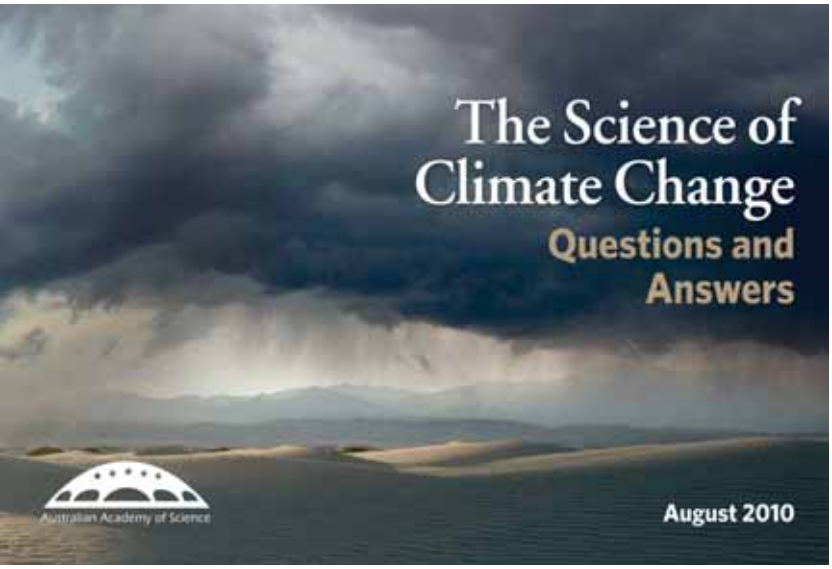
16 February – In a submission to the Rural Research and Development Council's *Draft national strategic rural R&D investment plan*, the Academy suggested clarifications to the Council's recommendations.

17 February – The Academy's response to the National Research Infrastructure Council's Discussion Paper, *Strategic framework for research infrastructure investment*, recommended that the Council consult decadal plans and discipline reviews prepared by the Academy's national committees for science as a guide to setting its framework.

3 March – In its submission to the Senate inquiry into the *Patent Amendment (Human Genes and Biological Materials) Bill 2010* the Academy argued that the proposed amendments went too far, and would restrict Australian access to new treatments and diagnostic procedures.

9 March – The central argument of the Academy's submission to the *Review of human cloning and stem cell research legislation*, is that these laws have served Australia well and do not need revision.

The above submissions, statements and responses are available from **science.org.au/reports/index.html**



Minister Ferguson and Phil McFadden launch the Think Tank publication in January 2011

can develop a mutually beneficial relationship to examine collaborative opportunities to conduct scientific scoping studies.

Submissions by the Academy to Government reviews and inquiries

The Academy's submissions, statements, inputs and responses to various Government and Government agency inquiries into science policy issues are listed in Box 1.

Other major reports and publications

The science of climate change: questions and answers

Leading Australian climate scientists developed *The science of climate change: questions and answers* publication with sponsorship from the Department of Climate Change to address confusion created by contradictory information in the public domain. It identifies the key scientific questions the Australian public is asking about climate change and provides accurate responses in a suitable form for non-specialists. Importantly, the document specifically addresses where there is consensus in the scientific community and where uncertainties still exist in regard to climate science.

The launch on 16 August at the Shine Dome to coincide with National Science Week 2010 was webcast by the Science Media Centre, enabling questioning by a dozen journalists from around the country and was widely reported in the print and electronic media, including being featured on ABC's *Four Corners*. The climate change publication was subsequently serialised on crikey.com resulting in significant increases in downloads and requests for hardcopies.

The response to the publication has been powerful and overwhelmingly positive both in Australia and overseas. There has been strong demand for the publication. Over 40,000 hardcopies have been printed and it has also been downloaded from the Academy's website over 142,000 times. To date 9,500 copies of the publication have been distributed to Australian high schools (two copies each) and 14,000 copies (25 copies each) to all local government authorities. Copies have also been distributed to members of Federal Parliament, Commonwealth, state and territory departments, peak bodies, industry representatives, community groups, and Australian and foreign embassies.

The publication is available from **science.org.au/reports/climatechange2010.pdf**

Proceedings 2010 Theo Murphy High Flyers Think Tank – *Searching the deep Earth: the future of Australian resource discovery and utilisation*

The key outcome of the 9th Think Tank was the recommendation for a national road map for deep Earth exploration that integrates components of the Federal innovation effort in a coherent deep Earth mapping program to provide new

opportunities for mineral exploration. The proposed roadmap would be underpinned by six initiatives which include national maps of the depth and character of the cover of Australia, as well as the deep crust and adjacent upper mantle.

On launching the proceedings of the Think Tank on 11 January, the Hon Martin Ferguson AM MP, Minister for Resources and Energy, requested further information on the report recommendations and implementation. He also commented that,

> It is by no means an overstatement to say that *Searching the deep Earth: the future of Australian resource discovery and utilisation* is at the heart of our nation's continued prosperity.

Two hundred and fifty hard copies and a similar number of electronic copies of the proceedings have been distributed to Think Tank participants and key stakeholders from research, government and industry.

The publication is available from **science.org.au/events/thinktank/thinktank2010/index.html**

2010–2019 Decadal plan for Australian space science – building a national presence in space

This document presents the first decadal plan for Australian space science outlining the importance and current status of space science in Australia, and the specific scientific goals of the Australian space science community for the period 2010–19. Developed by the National Committee for Space Science, the plan provides a consolidated vision for space science and technology in Australia. It aims to build Australia a long term, productive presence in space via world-leading innovative space science and technology, strong education and outreach, and international collaborations. The plan was funded by an ARC Learned Academies Special Projects (LASP) grant and then launched by the Chief Executive Officer of the ARC, Professor Margaret Sheil, at the 10th Australian Space Science Conference in Brisbane in September 2010.

The publication is available from **science.org.au/natcoms/nc-space.html**

To live within Earth's limits: an Australian plan to develop a science of the whole Earth system

The science of the whole Earth system is an evolving, highly interdisciplinary field that aims to balance the needs of people and the physical and biological limits of the planet by treating the Earth as a single, complex and dynamic system. The National Committee for Earth System Science (NCESS) undertook an extensive consultation process to inform the development of *To live within Earth's limits: an Australian plan to develop a science of the whole Earth system*.

The document sets out a systematic and coherent plan to establish a community of Earth system scientists in Australia to develop a body of fundamentally interdisciplinary knowledge –

PHOTO: ANDREW SIKORSKI

Penny Sackett launches *To live within Earth's limits: an Australian plan to develop a science of the whole Earth system*

combining inputs from the natural and social sciences, economics, and the humanities – that will assist in securing a resilient Earth system. The work of the NCESS is contributing to international planning in both the International Geosphere-Biosphere Program (IGBP) and the International Council for Science (ICSU) Earth system science visioning process.

The preparation of the plan was funded by DCCEE. The plan was launched by the Chief Scientist, Professor Penny Sackett, during the First Australian Earth System Outlook Conference held at the Shine Dome, Canberra on 9 and 10 December 2010 as the first step in its implementation.

The publication is available from **science.org.au/natcoms/nc-ess.html**

PMSEIC expert working group reports

Academy Fellows had leadership roles in two PMSEIC Expert Working Group reports during the reporting period. Dr Michael Raupach FAA was the chair, and Professor Kurt Lambeck AO FAA FRS was the deputy chair of the PMSEIC Expert Working Group on Challenges at Energy-Water-Carbon Intersections. Professor Robin Batterham was the deputy chair for the PMSEIC Expert Working Group on Australia and Food Security in a Changing World.

These respective reports, *Challenges at energy-water-carbon intersections* and *Australia and food security in a changing world* were released in December 2010 and formally presented to a meeting of PMSEIC on 4 February 2011.

The publications are available from **www.chiefscientist.gov.au/tag/pmseic/**

Learned Academies Special Projects (LASP)

In April, the Academy was awarded $360,000 over three years from the ARC for a 2010 LASP grant *Australia 2050: achieving an environmentally sustainable and socially equitable way of living*. The project steering committee is chaired by Dr Michael Raupach.

The Australia Council of Learned Academies – formerly the National Academies Forum – also received $300,000 over three years for a LASP proposal *Making interdisciplinary research work – achieving a sustainable Australia*. Professor Bob Williamson FAA, Secretary for Science Policy, is the Academy's representative on the project steering committee.

Activities for younger researchers

THE ACADEMY HAS LONG RECOGNISED THE DEVELOPMENT OF COLLABORATIVE NETWORKS WITH PEERS AND MORE SENIOR RESEARCHERS, BOTH IN AUSTRALIA AND OVERSEAS, AS ESSENTIAL TO THE ESTABLISHMENT OF A CAREER IN SCIENCE.

Many Academy events incorporate networking opportunities and skills training for early and mid career researchers (EMCRs) and some of these are described below. The Academy also provides a range of awards and administers government-funded programs to support young researchers to participate in international research exchanges which are described in the International activities section of this report.

In February, an early career researcher (ECR) policy intern position was created by the Academy. The intern will provide dedicated support to existing programs and progress the development of new initiatives, while gaining practical exposure to the science policy work of the Academy.

High Flyers Think Tanks

The Academy's High Flyers Think Tanks bring together outstanding ECMRs from a broad range of disciplines to identify gaps in knowledge and propose novel applications of science and technology to address issues of national importance.

The 2010 Theo Murphy High Flyers Think Tank, *Searching the deep Earth: the future of Australian resource discovery and utilisation* was held at the Shine Dome, Canberra on 19 and 20 August 2010. The event's organising committee, chaired by Dr Phillip McFadden FAA, brought together around 60 outstanding young scientists in minerals exploration from across Australia with experts from industry and government research agencies.

The selection of the Think Tank topic reflected the recognition that while mining is an important part of Australia's economy, it is becoming increasingly difficult to discover world class ore deposits due to the continent's thick layer of weathered rock, sediment and soil that pose formidable exploration challenges.

Eighty-three per cent of the 2010 Think Tank evaluation respondents identified the event as either 'excellent' or 'good', indicating that the meeting was a highly successful networking opportunity that enabled participants to engage in shaping the future of their research discipline. Some of the comments made by respondents include:

> The opportunity to network with other Australian researchers – no other forum I have attended was this effective.

> Being given the opportunity to shape the future of research in my discipline, networking and understanding how science can influence decision making in politics.

> The outcomes, which I thought were clear and presented useful vision to put to policy makers… also the fact that this has the potential to impact at the highest levels of government.

Frontiers of Science meeting

By focusing on generating understanding between disciplines rather than their application to specific issues, the Academy's Frontiers of Science events aim to enhance the capability of young researchers to participate in multi and interdisciplinary research.

The 2010 Frontiers of Science meeting was held in Perth, Western Australia as a bilateral meeting with the Royal Society of London as part of worldwide celebrations to mark the Royal Society's 350th anniversary.

For the first time, the meeting focused on a specific area of research – the diverse field of marine science. It brought together 70 EMCRs from the UK and Australia for five days from 9 to 13 October to discuss cutting-edge marine science relevant to the understanding and management of the marine environment.

Participants were welcomed by the Academy's President, Professor Suzanne Cory and the Royal Society's Vice-President and Foreign Secretary, Professor Lorna Casselton FRS. The meeting was formally opened by the Chief Scientist of Western Australia, Professor Lyn Beazley AO FTSE.

Dr Willem Sijp, Professor Matthew England and Dr Steven Phipps, UNSW marine scientists at the 2010 UK–Australia Frontiers of Science meeting

The talks were organised as a series of themed sessions, including marine ecosystems, marine biogeochemical cycles, carbon sequestration in the ocean and ocean acidification. Topics ranged widely from polar to tropical locations, the seafloor to surface waters, the geological past to the present day, and applying modelling, field work and management perspectives.

The event was supported by the UK and Australia Theo Murphy Funds with minor sponsorship from the Australian Institute of Marine Science and the Western Australian Government's Department of Commerce.

Seventy-five per cent of evaluation respondents identified the 2010 Frontiers of Science meeting as being excellent and 100 per cent rated the meeting as excellent or good. Seventy-nine per cent of respondents also identified that the scientific content of sessions would impact on their future work.

Impacts identified included whole new research directions, changes in the content of undergraduate teaching or new opportunities to work in interdisciplinary research teams. A tangible short term outcome was a successful bid for $30,000 in Australian National Network in Marine Science (ANNIMS) funding to enhance moorings near Ningaloo Reef with bio-optical and additional physical sensors.

The chairs of the Frontiers of Science meeting, Thomas Webb (UK) and Elvira Poloczanska (Australia) published an article in the Royal Society's *Biology Letters* about the meeting. It highlighted that the value of bringing together researchers from different disciplines – a major goal of the Academy's Frontiers of Science meetings – had been achieved. They stated that,

> A strength of the Frontiers of Science was to bring together modellers and empiricists in discussions focused on generic problems, rather than on specific methodologies. This approach offers the best pathway to understanding the marine environment.

The full article is available from **http://rsbl.royalsocietypublishing.org/content/early/2011/01/03/rsbl.2010.1120.full.pdf?ijke=**

Detailed information of the program and abstracts are available from **science.org.au/events/ frontiers/ frontiers2010/index.html**

PHOTO: JOHN ALTIN

Kurt Lambeck with the Australian delegates to the 2010 meeting of the Nobel Laureates in Lindau: J Altin, D Cocks, C Hales, H Joyce, Z Kaul, Z Kovacevic, K Markey, D Miles, D Mortimer, J Pedro, T Reekie, C Tam and L Warszawski

Workshops for ECRs at Science at the Shine Dome

In May 2010, the Academy welcomed over 65 ECRs from a diverse range of disciplines to the 2010 Science at the Shine Dome. Sponsorship to support the attendance of 10 ECRs was received from the ARC, the National Health and Medical Research Council (NHMRC), the Bureau of Meteorology, DSTO, and the Australian Antarctic Division (AAD).

ECRs attended all the seminars at the event as well as one of three specific career development workshops offered:

- *Science communication and the media* – presented by Dr Paul Willis from the ABC TV's *Catalyst* program
- *Commercialising scientific research* – presented by Dr Darren Cundy, CSIRO, and Tricia Berman, DIISR
- *Skills for successful grant writing* – presented by Professor Maria Makrides, Child Health Research Institute; Professor Bob Gibson, University of Adelaide; Professor Hans A Bachor, Australian National University; and Professor Ian Petersen, University of New South Wales at ADFA.

Feedback about the whole program was positive, with participants identifying the potential for collaboration and opportunities to develop networks by interacting with Academy Fellows and other ECRs. Some highlights follow,

> I had a discussion with Patrick De Deckker [2010 Mawson medallist] that has lent new insight to my interpretation of ice core data spanning the last deglaciation.

> Yes, a potential collaboration with an AAS Fellow who was previously unaware of my research.

> I expect to be discussing the possibility of establishing a collaboration with this Fellow in the next few weeks.

> The Academy can be very proud of the program it offers to ECRs during SATS.

Lindau Nobel Laureates meeting

The 60th meeting of Nobel Laureates in Lindau from 26 June to 1 July 2010 was only the third time an interdisciplinary meeting combining biological and physical themes has been held. For this reason, the Academy sponsored 14 young Australian scientists (double the normal number) to participate in a delegation led by former Academy president Professor Kurt Lambeck.

The meeting brought together more than 650 young researchers from around the globe with approximately 59 Nobel Laureates from the fields of physiology or medicine, physics and chemistry.

Charmaine Tam, one of the 2010 delegates pictured above, reported,

> The meeting was a once in a lifetime experience and was definitely the pinnacle of my scientific career to date.

The annual report of the 2010 interdisciplinary meeting of Nobel Laureates is available from **www.lindau-nobel.org/**

Four members of the Australian delegation were also selected as Robert Bosch Fellows to attend the Euroscience Open Forum (ESOF) in Turin, Italy, following the meeting in Lindau. The ESOF meetings bring together scientists, business people, entrepreneurs, innovators, policy makers and science and technology communicators as well as

the general public, to discuss new discoveries and the direction that research is taking in the sciences, humanities and social sciences.

Early days newsletter

Early days was initiated in September 2009 to provide information on various topics of relevance to ECRs, including overseas exchange programs, fellowships, honorific awards and research funding opportunities. It also contains interviews with senior scientists and articles by guest contributors.

Since April 2010, three issues have been distributed to all ECRs on the Academy's opt-in email register. All Fellows also receive copies. The subscriber list has more than doubled since last year, increasing from approximately 400 to 900.

The list also provides a mechanism for the Academy to alert subscribers to activities by other organisations, such as the opportunity to make submissions on the ARC Discovery Program consultation paper which was released in November 2010.

Early days is available from **science.org.au/ecr/ecr-newsletters/**

National committees for science

THE ACADEMY'S NATIONAL COMMITTEES FOR SCIENCE EACH FOSTER A DESIGNATED BRANCH OR THEME OF NATURAL SCIENCES IN AUSTRALIA AND SERVE AS A LINK BETWEEN AUSTRALIAN AND OVERSEAS SCIENTISTS IN THE SAME FIELD.

The Academy's 21 national committees and three task forces are widely representative of the Academy's science disciplines. The Academy seeks nominations for committee members from committee chairs and relevant corresponding scientific societies. The nominations are then considered and appointed by the Academy's Executive Committee.

The membership of each committee and documents related to their activities are available from **science.org/natcoms/**

Guidelines for national committees are available at **science.org.au/natcoms/guidelines**

The national committees also advise the Academy on the appointment of voting delegates to meetings of the International Council for Science (ICSU) and the member scientific unions for which the Academy is Australia's adhering body.

Meeting of the chairs of national committees and taskforces

The 2010 meeting of national committee chairs that was held on 22 September 2010 provided an opportunity to update attendees on the activities of the national committees. Representatives of 20 committees and task forces attended. The meeting identified areas of common concern and interest across the disciplines, encouraging links between national committee chairs who might otherwise have been unlikely to interact due to the disparate nature of their disciplines.

Major items of discussion included relationships with international bodies, women in science, the *Excellence in research for Australia* initiative, funding sources particularly in relation to the production of discipline strategic plans, and education, training and career structures – particularly with reference to early to mid career researchers.

Based on advice from the 2009 chairs meeting a new committee for ICSU coordination has been established.

ICSU coordination

Chair: Professor Bruce McKellar FAA

The National Committee for ICSU Coordination was formed in mid 2010 to advise Council on and strengthen interactions between the Academy and ICSU, and provide advice on material received from ICSU requiring a response from the Academy. In addition to the chair, who also chairs the ICSU Regional Committee for the Asia and the Pacific, the members are Professor David Vaux FAA, Professor Jenny Graves FAA, Professor Cheryl Praeger FAA and Dr John Zillman FAA.

The first meeting on 3 September 2010 was devoted to reviewing the committee's terms of reference and preparing for the discussion of ICSU matters at the meeting of chairs of national committees, held later that month. The committee met again on 10 November, the day before the meeting of the ICSU Regional Committee for Asia and the Pacific (RCAP) in Canberra. The primary task of that meeting was to set out the 2011 work plan. There are two major components of the 2011 work plan:

- to advise Council on responses to a number of draft documents expected from ICSU as it prepares for its 2011 General Assembly in September 2011. The most important of these documents will be the ICSU strategic plan for 2012–17
- to assist national committees to enhance their connections with equivalent international unions or ICSU interdisciplinary and co-sponsored bodies.

The committee also took the opportunity to meet the members of the ICSU Regional Committee for Asia and the Pacific informally for a lively discussion on matters of mutual interest.

Committee reports

Reports have been received from the following committees:

Antarctic research

Chair: Professor Robert Vincent FAA

The Scientific Committee for Antarctic Research (SCAR) XXXI delegates meeting held in Buenos Aires, Argentina from 9 to 11 August was the main focus for 2010. It was preceded by meetings of the SCAR business groups – geophysics, life sciences and physical sciences, from 30 July to 2 August, and the 3rd Open Science Conference from 3 to 11 August. The Council of Managers of National Antarctic Programs (COMNAP) met simultaneously with the SCAR delegates meeting.

Thirteen Australian scientists attended the Open Science Conference, including five scientists from the Australian Antarctic Division (AAD) and one graduate student. Despite a relatively small representation, Australian attendees were prominent at the meetings. Out of the four invited talks at the SCAR delegates meeting, three were by Australians. Dr Steve Rintoul FAA – *The Southern Ocean Observing System* – and Kim Finney – *A strategy for data and information management* – gave talks to joint plenary sessions at both SCAR and COMNAP, while Professor John Storey from the University of New South Wales gave a talk to SCAR on *Astronomy and astrophysics research in the Antarctic*.

The national committee continued to provide input into the AAD decadal strategic plan, which will set the science strategy for Australia's Antarctic science program. Ratification of the strategic plan did not occur until mid 2010 due to delays in the plan's development. Full implementation will start in 2012.

A public lecture commemorating the end of the International Polar Year took place in Coffs Harbour in July. The talk by Dr Simon Wright (AAD) was very well received, with the audience containing many young people and previous Antarctic expeditioners.

National Committee for Astronomy

National Committee for Brain and Mind

Astronomy

Chair: Professor Elaine Sadler FAA

The National Committee for Astronomy (NCA) has progressed a mid-term review of our 2006–15 decadal plan. The final document will be published in 2011. Astronomy has been strongly supported by the Australian Government over the past five years, with significant financial investment in infrastructure for new research facilities and the recent recognition of space science and astronomy as one of Australia's three 'super science' areas.

The number of active astronomers working in Australia has grown by more than 20 per cent since 2005, mainly through an increase in the number of PhD students and fixed-term research positions. The mid-term review shows that the discipline is healthy and on track to achieving the main decadal plan goals. Some challenges remain, however. These include the need for ongoing operational funding to realise the full potential of new national research facilities, the complex international landscape for global projects like the Square Kilometre Array and Extremely Large Optical Telescopes, and identifying longer-term career paths for the best young researchers. The NCA continues to work on the implementation of the decadal plan in conjunction with Astronomy Australia Limited, which manages those aspects of the plan supported by the 'Radio and Optical Astronomy' National Collaborative Research Infrastructure Strategy (NCRIS) funding.

Biomedical sciences

Chair: Professor Ian Dawes FAA

The National Committee of Biomedical Sciences (NCBMS) met twice during 2010, in June and October. The committee has seen a substantial turnover in membership since 2009, with new members representing the Australian Society for Immunology, the Australia New Zealand Society for Cell and Developmental Biology, the Australian Physiological Society and the Australian Biophysical Society.

The NCBMS has continued to strengthen links with the broad range of societies that it represents – currently all members of the committee are on the executive of their corresponding society – and discussion was held during the year with other biomedical societies that are not well represented, especially in the field of genetics. Given the number and diversity of the current societies represented, the NCBMS discussed mechanisms to increase the interaction between those societies to promote biomedical science as a whole. This currently includes efforts to extend initiatives in schemes to promote young researchers, outreach and promotion of biomedical science and related initiatives to involve cooperation between the societies. Reports were received from Professor Miles Davenport about the World Day of Immunology and from Sarah Dunlop about the Brain Bee program organised by the Australian Neuroscience Society. The anticipated joint meeting with the National Committee for Medicine remains a priority for 2011.

The proposed 2nd National Forum on Education in the Biomedical Sciences has been progressed and is currently being organised by Professor Phillip Poronnik from RMIT with the likely date in December 2011.

Brain and mind

Chair: Professor Stephen Crain

The National Committee for Brain and Mind is undertaking a three-year project with a number of objectives. The committee is collating a list of research facilities in Australia that use brain imaging technology to study cognition and cognitive disorders. A collection of introductory descriptions (both in print and in video format) of how brain imaging systems operate and a discussion piece entitled *Fact, fiction and forecast* are in development to demystify the use of brain imaging techniques, and to describe what brain imaging technology can and cannot contribute to diagnosis and treatment of cognitive disorders. In 2010, the committee began putting together materials relating to the use of brain imaging systems with normally

developing children and with children with cognitive disorders such as autism spectrum disorder, dyslexia and specific language impairment. To meet the goal of engaging with the secondary and/or tertiary education sectors, a collection of resources for high school students in years 11 and 12 is in preparation. Additional material will be developed as a resource for the community, with the goal of enhancing community understanding of the discipline and providing valuable information for particular groups such as parents of children with cognitive disorders. All materials gathered will be reviewed before circulation.

In addition, the committee will consider proposing membership of the International Congress of Cognitive Science, to raise the international profile of research on brain and mind in Australia.

Chemistry

Chair: Professor Curt Wentrup FAA

The National Committee for Chemistry (NCC) is working closely with the Royal Australian Chemical Institute (RACI), and the November meeting of the committee was held jointly with the general assembly of the RACI. The RACI Congress was held in conjunction with the 12th International Union of Pure and Applied Chemistry (IUPAC) Congress on pesticide chemistry in July.

The NCC, in collaboration with RACI, is planning several activities in relation to the International Year of Chemistry (IYC) 2011 which also marks the 100th anniversary of Marie Curie's Nobel Prize in Chemistry, and the 100th anniversary of the founding of IUPAC (initially known as the International Association of Chemical Societies). Dr Vicki Gardiner, a member of the NCC as well as the RACI board, is the national coordinator of the IYC activities. The formal launch of Australia's IYC on 8 and 9 February 2011 took place in Parliament House, Canberra and included an opening ceremony, chemistry leaders' symposium and Department of Innovation, Industry, Science and Research (DIISR) touring exhibitions.

The NCC made a submission to the ARC on the *Excellence in research for Australia* (ERA) and the Australian Curriculum Assessment and Reporting Authority (ACARA) on the *Draft K-10 Australian curriculum: science*, requesting more explicit mention of chemistry.

Further submissions were made to the House of Representatives' Industry, Science and Innovation Committee's *Parliamentary enquiry into international research collaboration* and to the DIISR Consultation Paper *Meeting Australia's research workforce needs*. Curt Wentrup is a member of the expert group for DIISR's Case Study Chemical Sciences.

Crystallography

Chair: Professor Jenny Martin

The National Committee for Crystallography (NCCr) held its annual meeting at the Australian Nuclear Science and Technology Organisation in Sydney on 26 May 2010. The full-day strategic meeting

National Committee for Crystallography and observers at ANSTO

National Committee for Data in Science outside Ian Potter House

involved several items for discussion, including plans for the Bragg Symposium Celebration to be held in conjunction with the December 2012 Asian Crystallographic Association (AsCA) meeting to be held in Adelaide. The organising committee consists of Professor Steve Wilkins (NCCr member), Professor Jose Varghese (member of NCCr and President of the Society of Crystallographers in Australia and New Zealand), Dr Rob Robinson (NCCr member), Professor Peter Colman FAA, Associate Professor John Jenkin (La Trobe, University) and Professor John Carver (University of Adelaide).

Australian scientists were well represented at the very successful AsCA meeting in Busan, Korea in October – November 2010. The program chair was Professor Jenny Martin, current chair of NCCr. The 21st Australian Conference on Microscopy and Microanalysis (ACMM 21) was also held in Brisbane from 11 to 15 July 2010.

In addition, NCCr continues to support initiatives providing long-term funding and expanding the range of beamlines and capabilities at the Australian Synchrotron. Two members of NCCr, Professor Keith Nugent FAA and Professor Brendan Kennedy were appointed to the Board and Scientific Advisory Committee (SAC), respectively, of the Australian Synchrotron.

Taskforce of the National Committee for Crystallography

Chair: Professor John White FAA

2010–15 is expected to be an interesting quinquennium for nuclear policy in Australia and the Asia-Oceania region with a number of power and research facilities in various stages of commissioning and operation. The chair of this taskforce is also President of the Asia-Oceania Neutron Scattering Association. Links between these facilities and a training program for young scientists have been established by the taskforce.

The taskforce continues to consider the issue of low level ionising radiation. During visits in February and October 2010, Professor Doug Boreham and Professor Wade Allison, from McMaster University and University of Oxford respectively, lectured on this issue. The comments from these lectures and a book by Professor Allison will provide a substantial basis for a meeting of the taskforce in 2011. The joint academies report *Understanding the formation of attitudes to nuclear power in Australia*, **www.naf.org.au/documents/NAF-NuclearAttitudes.pdf**, was published in 2010 with contributions from this taskforce.

Data in science

Chair: Dr Rhys Francis

The committee continued to advance and scope its plans for an annual workshop to examine the state of play regarding data retention, management and access in data intensive disciplines, combined with a published report on the outcomes of each workshop. The intention is to develop baseline representation of progress in scientific data management and accessibility.

Developments towards the World Data System, made through 2010 by ICSU, provide impetus to plan for a first committee workshop to be held in July 2011.

Committee members attended the 2010 Committee on Data for Science and Technology (CODATA) General Assembly. The committee concluded that a proposal to host the 2012 CODATA General Assembly and a proposal to bid for the International Programme Office of the World Data System was premature.

Earth sciences

Chair: Professor Brian Kennett FAA

Australia will host the two main meetings for the international unions linked to the National

Committee for Earth Sciences (NCES) in the next two years:

- General Assembly of the International Union of Geodesy and Geophysics (IUGG) in Melbourne July 2011
- International Geological Congress (IGC) linked to International Union of Geological Sciences (IUGS), Brisbane, August 2012.

To achieve effective liaison, a member from each organising committee has joined the committee as an observer – Professor Ray Cas, Monash University, for IUGG 2011 and Dr Ian Lambert, Geoscience Australia, for IGC 2012. The NCES receives regular reports on the development of these meetings.

There has been extensive Australian involvement in the development of the scientific program for the IUGG General Assembly in Melbourne. Members of the committee are actively involved in the construction of the program outline for the IGC in 2012.

The NCES acts as the principal link to IUGG but only covers the topics of three of the eight associations comprising IUGG and cannot therefore provide a full interaction. To address this, a reference group will be formed encompassing all the IUGG associations, led by the chair of NCES.

Members of the NCES played an active part in organising the successful Australian Earth Sciences Convention which was held in Canberra in July 2010 under the theme *Earth systems: change, sustainability, vulnerability*. The NCES also made a submission on the draft senior secondary curriculum for Earth and environmental science.

In addition, NCES wrote to the National Committee for Astronomy (NCA) and Senator Kim Carr, Minister for Innovation, Industry, Science and Research raising the concept of co-locating geophysical equipment with the Square Kilometre Aperture Radio Telescope. A positive response was received from both the NCA and Senator Carr.

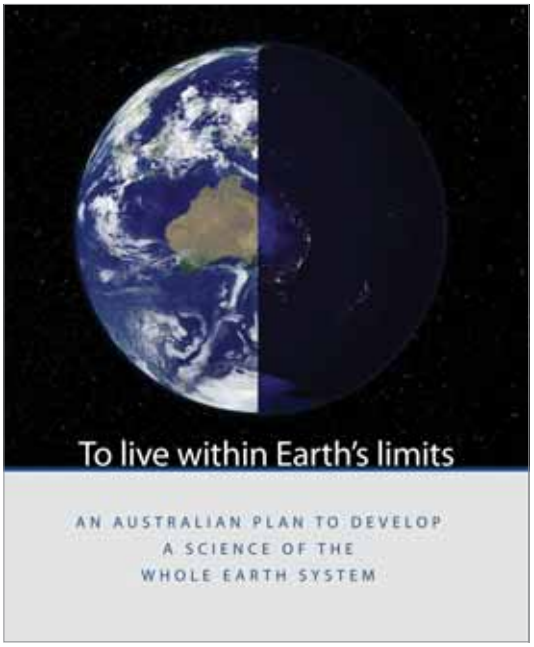
The Academy's Executive Committee has approved Dr Neil Williams as deputy chair of the NCES and expansion of the committee to include a representative of the geodetic community.

Earth system science

Chair: Dr Roger Gifford

The primary effort of the committee in 2010 was the finalising and publication of the decadal strategic plan for Earth system science *To live within Earth's limits: an Australian plan to develop a science of the whole Earth system*. After about four years of drafting and in contrast to narrower views of 'Earth system science' as the science of the fluid Earth and 'Earth science' as the science of the solid Earth, the final approach adopted considers Earth system science in the broadest sense incorporating all interacting spheres of the planet, including the human sphere.

The launch of the strategic plan by Chief Scientist Professor Penny Sackett at the First Australian Earth System Outlook Conference took place in December at the Shine Dome.



Geography

Chair: Professor Nigel Tapper

The National Committee for Geography (NCG) was involved in a number of initiatives to strengthen and secure the position of the discipline in Australia in 2010. Members of the NCG have been involved in the preparation of the curriculum shaping paper and in the curriculum reference group of the new Australian curriculum. During 2010 the NCG was also actively engaged in development of a Geography standards statement for the Australian Learning and Teaching Council (ALTC).

In early 2010 the NCG secured an ICSU grant entitled *Strengthening the bonds between scientific literacy and human understanding: local area networks to help build cross-border solutions for disaster management*, aimed at developing the scientific skills and competencies of young scientists in remote and developing locations of the

Asia and Pacific region. A project planning meeting involving young scientists from Indonesia, Thailand, Kiribati and PNG was held in Melbourne in October. Members of the committee also continued activity towards the publication, hopefully in late 2011, of a book *Schooling for sustainable development: a focus on Australia, New Zealand and the Oceania region*.

On 2 November 2010 a Strategic directions for geography 2010 and beyond think tank meeting was held in association with the NCG meeting in Canberra on 1 November. This meeting identified a number of initiatives and directions that will be followed up during 2011, in support of the discipline in Australia.

History and philosophy of science

Chair: Professor Rachel Ankeny

Seven entries were received for the 2010 National Museum of Australia (NMA) student essay prize in Australian history of science or environmental history. All were of a good to excellent standard, with several considered by reviewers to be suitable for scholarly publication. Many of the essays straddled the categories of 'environmental history' and the 'history of science', suggesting that combining these two categories has not weakened the field. The judging panel comprised the chair, Dr Mike Smith (NMA), and Dr Libby Robin (NCHPS). The prize of $2500 was awarded to Luke Keogh, PhD candidate at the University of Queensland, for his entry *Duboisia pituri: a natural history*.

The NCHPS continued to work with Gavan McCarthy (University of Melbourne), to help achieve the aims of the World History of Science Online project (**www.dhst-whso.org/**), whose main objectives are providing central online access to bibliographies and catalogues of archives and sources including scientific and technological bibliographies and archival sources in order to build capacity in history of science and technology in all countries.

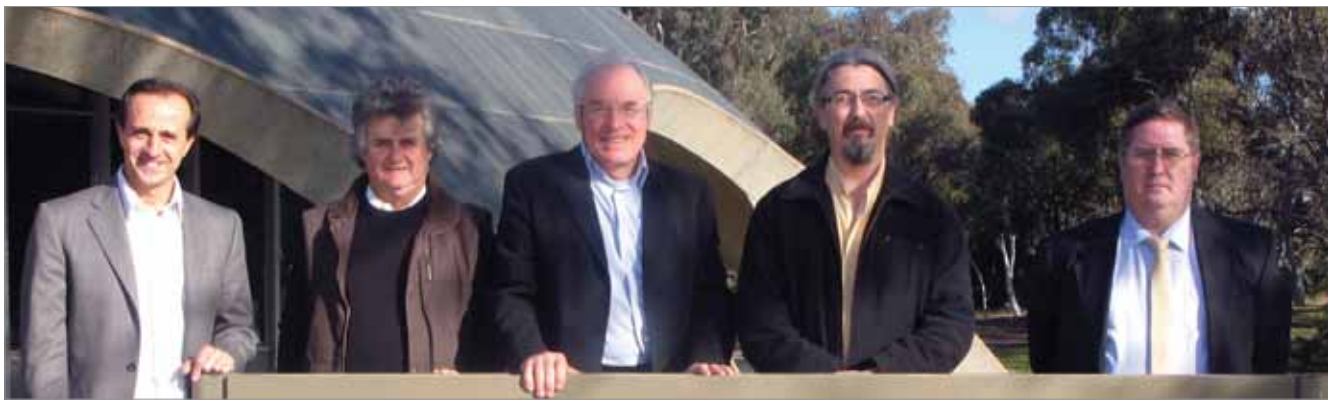
The NCHPS participated in international and national discussions relevant to the discipline of history and philosophy of science, relating to research reporting, journal ranking processes, and development of standards for teaching undergraduate history.

Mathematical sciences

Chair: Professor Hyam Rubinstein FAA

Two meetings of the committee were held in 2010 – by teleconference on 5 August and in Perth on 28 February 2011. Key activities in the mathematical sciences included the release of the GO(8) review of mathematical sciences, discussions between the

National Committee for Mathematical Sciences at the University of Melbourne



National Committee for Mechanical Sciences outside the Shine Dome

mathematical sciences community, the ARC and the Federal Government about ways to support a national mathematical sciences institute and outcomes from the International Mathematical Congress (IMU) which was held in India in August 2010. Professor Cheryl Praeger has been re-elected to the IMU executive committee. Professor Nalini Joshi FAA has been appointed to the resolutions committee and the working group on journal rankings of the IMU, in recognition of the work done by the Australian mathematical community in journal ranking for the *Excellence in research for Australia* (ERA) initiative and is the incoming chair for 2011.

The decline of mathematics education in Australia remains a concern. The latest *Trends in international mathematics and science study* (TIMSS) international comparisons show that Australia is lagging behind other Organisation for Economic Cooperation and Development (OECD) countries, especially our Asian neighbours, in both standards and attitudes towards mathematics in schools. The Deans of Science have long reported a declining number of qualified mathematics teachers, recognising the negative impact on science and technology for Australia in universities and in trades.

Mechanical sciences

Chair: Associate Professor Jim Denier

The National Committee for the Mechanical Sciences (NCMS) met in June 2010 welcoming a number of new members. Consideration of the history and future of the committee led to discussion on refocusing the committee away from mechanics and mechatronics to encompass the wide range of activity that falls under the general title of engineering science in Australia. The defining feature of engineering science is the use of advanced mathematics, computation and technology to solve real world problems and provide the knowledge base that engineers require for their work.

A formal proposal to reconstitute the NCMS as the National Committee for the Engineering Sciences will be developed and put forward to the Academy's Executive Committee for approval.

Medicine

Chair: Professor Bronwyn Kingwell

The National Committee for Medicine (NCM) met twice in 2010. A face to face meeting took place in April, attended by The Hon Mark Butler, Parliamentary Secretary for Health. Professor Warwick Anderson, Chief Executive Officer of the National Health and Medical Research Council (NHMRC) also joined by teleconference. Professor Warwick Anderson also joined the second meeting, held via teleconference in November.

The NCM has also engaged with other health and medical research groups to identify unified strategies and actions including:

- Research Australia
- Australian Society for Medical Research (ASMR)
- Association of Australian Medical Research Institutes (AAMRI)
- The NCM has provided input to NHMRC through responses to formal consultations and also directly via the CEO.

The NCM has also kept a watching brief on the mechanisms to safeguard the integrity of Australian research, following the release of the Australian Code for the Responsible Conduct of Research in 2007 and formation of the Australian Research Integrity Commission in 2010.

National Committee for Quaternary Research outside Ian Potter House

Nutrition

Chair: Professor Jennie Brand-Miller

During 2010, the National Committee for Nutrition's primary focus was the organisation of a two-day international workshop in December aimed at identifying the gaps in knowledge at the nexus between sustainable agriculture and health. The changing environment – food security, climate change, elevation of CO_2 levels, increasing global prevalence of obesity/diabetes/cardiovascular disease and nutritional deficiency – were a backdrop to these discussions.

The workshop was held under the auspices of FoodPlus, University of Adelaide and the NCN. The international invited discussants included Professor Bo Lonnerdal, University of California, Davis, USA; Professor Dennis Bier, Baylor College of Medicine, Houston, USA, as well as editor in chief of the American *Journal of Clinical Nutrition*; and Professor Peter Aggett, University of Central Lancashire, UK. Approximately 30 national opinion leaders in the areas of nutritional science, agriculture (plant and animal breeding, plant and animal nutrition), food science, food manufacture and health attended. Attendance was by invitation only. The outcomes of the workshop are now being analysed as a backdrop to a decadal plan.

Physics

Chair: Professor Michelle Simmons FAA

The National Committee for Physics is currently overseeing the development of a decadal plan for physics via a working group convened by Professor David Jamieson of the University of Melbourne. The working group members are Professor Hans Bachor (Australian National University), Dr Cathy Foley (CSIRO), Professor Ian McArthur (University of Western Australia), Professor John O'Connor (University of Newcastle), Professor Halina Rubinstein-Dunlop (University of Queensland) and Associate Professor Brian James (University of Sydney).

The plan consists of two components. The first is a survey of the state of physics in Australia today, which will show how the discipline has evolved since the 1990s and highlights significant areas of activity and expertise. The second is a forward-looking component that aims to identify emerging opportunities for the discipline and demonstrate the future potential for physics in the 21st century.

Following the Australian Institute of Physics Congress in December 2010, the group is currently running an open consultation process and submission to **www.physicsdecadalplan.org.au**

Following a review of the draft plan – provisionally titled *Investing in the future of physics* – it will be presented to the Academy in July 2011.

Plant and animal sciences

Chair: Dr TJ Higgins FAA

The committee identified gaps in knowledge/capacity for the discipline area and discussed a number of areas of concern.

The committee also made a submission on the DIISR consultation paper to inform the development of the Australian Government's research workforce strategy and contributed to the Academy's submissions to the Productivity Commission inquiry and draft report on the *Rural research and development corporations model*.

Quaternary research

Chair: Professor Allan Chivas FAA

The new chair of the National Committee for Quaternary Research (NCQR) is also President of the International Union of Quaternary Research (INQUA). At a meeting of NCQR on 11 November 2010 at Ian Potter House, committee representatives were identified to monitor the various INQUA commissions and provide feedback to the NCQR. INQUA matters including the upcoming 18th INQUA Congress and General Assembly on 20 to 27 July 2011, Bern, Switzerland, and steps towards a strategic plan for quaternary research were also discussed.

Radio science

Chair: Professor Andrew Parfitt

The committee acts as a conduit to the scientific community for communications from the 10 scientific commissions of the International Union of Radio Science (URSI).

Committee member Dr Phil Wilkinson continues as Vice-President of URSI in his second and final term. All URSI commission representatives (with the exception of Commission K – Electromagnetics in Biology and Medicine) were appointed in preparation for the 2011 General Assembly to be held in Istanbul, Turkey from 13 to 20 August 2011.

The International Conference on Electromagnetics in Advanced Applications (ICEAA '10), was held from 20 to 24 September 2010 in Sydney. Thirty-five countries were represented. This is the first time that the event has been held outside Italy where it was established. The local organising committee chair was Professor Paul Smith of Macquarie University.

Space science

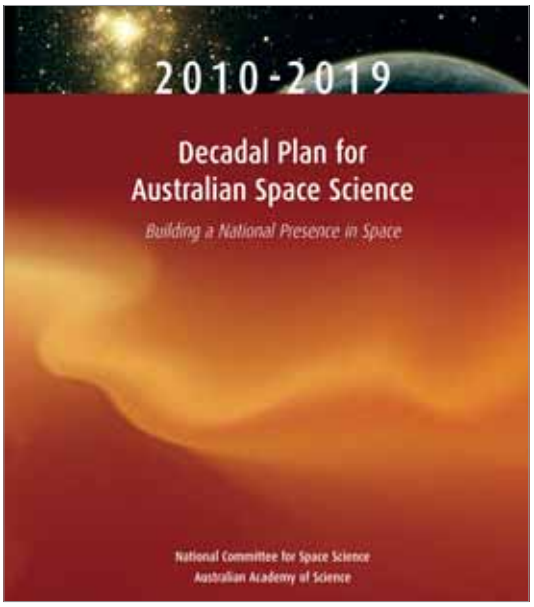
Chair: Professor Iver Cairns

2010 was a defining and extremely busy year for the National Committee for Space Science (NCSS). Three major items are reported here, in addition to managing Australia's participation in international societies for space science (Committee on Space Research (COSPAR), International Association for Geomagnetism and Aeronomy (IAGA), International Union for Geodesy and Geophysics (IUGG), and Scientific Committee on Solar-Terrestrial Physics (SCOSTEP)).

Professor Margaret Sheil, CEO of the ARC, launched the first *Decadal plan for Australian space science* on 27 September 2010, at the University of Queensland during the Australian Space Science Conference (ASSC) and received extensive media coverage.

NCSS jointly sponsored and organised the 2010 ASSC meeting with the National Space Society of Australia and the Australian Space Research Institute. This included presentations on the recent return of Japan's Hayabusa spacecraft to Australia and on the proposed GRACE-2 mission, as well as workshops on the flagship projects of the decadal plan.

NCSS also made multiple presentations to the Committee on Space Research (COSPAR), the Australian Institute of Physics, and other groups to promote the plan and Australian space science.



Muses-C (Taskforce of the National Committee for Space Science)

Chair: Professor Trevor Ireland

On 13 January, at 11.21 pm local time in South Australia, the Hayabusa Spacecraft and the Sample Return Capsule (SRC) made a spectacular re-entry to Earth. The arrival was the culmination of a seven-year space mission including travel to asteroid Itokawa, two touchdowns and return travel. Despite problems with the propulsion and stabilisation systems of the spacecraft, the re-entry was flawless. The spacecraft was recovered, cleaned and shipped back to Japan. Over 1,500 particles from the asteroid were recovered from the SRC. Their compositions indicate minerals common in chondrite meteorites, verifying the extraterrestrial origin of the dust in the SRC. Following the preliminary examination in Japan, particles will be available to the international community for analysis. The success of the Hayabusa mission bodes well for the next mission, Hayabusa II which is intended to visit another class of asteroid.

Spectroscopy

Chair: Professor Keith Nugent FAA

Historically, the National Committee for Spectroscopy (NCS) has primarily concerned itself with issues around optical and laser spectroscopy, broadly interpreted. However these fields have evolved to the point where optical and laser spectroscopy might be regarded as well-developed scientific tools deeply embedded within other disciplines and dealt with by other national committees for science. The main item of business for the committee had become the administration of the prestigious Frew Fellowship.

Accordingly, the committee undertook an informal review of its relevance and identified areas of spectroscopy that are not well represented in its membership and which have continued scientific topicality. In particular, given the establishment of the Open Pool Australian Lightwater (OPAL) research reactor and the Australian Synchrotron, it was noted that the areas of X-ray and neutron spectroscopy should appropriately be included within the purview of the NCS. New members of the committee have been recruited who will be able to contribute to the oversight of the development of spectroscopy across these areas, and who will be able to contribute advice on issues around the support and development of these two new landmark pieces of Australian scientific infrastructure.

International activities

ONE OF THE KEY OBJECTIVES OF THE ACADEMY IS TO FOSTER EXCELLENCE IN AUSTRALIAN SCIENTIFIC RESEARCH, INCLUDING FACILITATING ACCESS TO INTERNATIONAL SCIENTIFIC ORGANISATIONS AND PROGRAMS, SUPPORTING THE PROMOTION OF AUSTRALIAN SCIENCE CAPABILITIES INTERNATIONALLY AND CONTRIBUTING EXPERTISE AND LEADERSHIP IN REGIONAL AND GLOBAL COLLABORATIVE NETWORKS.

International Council for Science

The International Council for Science (ICSU) is a non-governmental organisation with a global membership of international scientific unions (30 members), associated interdisciplinary bodies (17 in total) and national scientific bodies (121 members representing 141 countries). The Academy is Australia's adhering body for ICSU, for 21 of ICSU's member unions and for nine interdisciplinary bodies.

ICSU's mission is to strengthen international science for the benefit of society, aiming to address this mission by:

- identifying and addressing major issues of importance to science and society
- facilitating interaction amongst scientists across all disciplines and from all countries
- promoting the participation of all scientists in the international scientific endeavour
- providing independent, authoritative advice to stimulate constructive dialogue between the scientific community and governments, civil society, and the private sector.

ICSU mobilises knowledge and resources to focus on activities in three areas: international research collaboration, sciences for policy and universality of science. This is done through links with strategic partners, the scientific community, policy makers and the broader society.

ICSU has established regional offices in Africa, the Arab region, Asia and the Pacific and Latin America. The Regional Office for Asia and the Pacific (ROAP) was established in 2006 and is based in Kuala Lumpur, Malaysia. The office promotes the development of science throughout Asia and the Pacific and helps strengthen the participation of scientists in international research from developing countries in the region. The Academy has maintained strong links with ROAP since its inception and its priority areas are:

- the ecosystem
- human-induced and natural hazards and disasters
- sustainable energy.

ROAP's activities are guided by the ICSU Regional Committee for Asia and the Pacific (RCAP). This committee is chaired by Professor Bruce McKellar FAA and consists of 13 members from across the region.

The Academy hosted the 10th meeting of RCAP on 11 and 12 November 2010; the first time that the committee has met in Australia. RCAP met with Professor Deliang Chen, Executive Director for ICSU; Professor Nordin Hasan, Director of ROAP; Canberra-based scientists and members of the Academy Executive. Professor Penny Sackett, Chief Scientist for Australia, also attended.

International scientific unions

The Australian research community is well represented internationally with 64 Australian researchers either members, or on the executive committees, of the 31 international scientific unions. Among these there are five Australian presidents and seven vice-presidents and two secretary generals, as listed in Table 3.

International scientific meetings held in Australia at the invitation of the Academy

The Academy, as the adhering body on behalf of Australia to ICSU, is often asked to endorse bids to host international scientific meetings in Australia. The Academy has issued a set of guidelines with respect to bids for international conferences. These are available from **science.org.au/internat/reporting.html**

The General Assembly of the International Union of Psychological Science was held during the 27th International Congress of Psychology in Melbourne in October 2010.

At the initiative of the Academy, and on behalf of the Australian research community, the following international meetings will be held in Australia:

- International Botanical Congress, Melbourne 2011
- International Union of Geodesy and Geophysics, Melbourne 2011
- International Geological Congress, Brisbane 2012
- International Union for Pure and Applied Biophysics Congress, Brisbane 2014.

ICSU delegates

The Academy appoints voting delegates to the business meetings of ICSU international scientific unions and interdisciplinary bodies, after advice is sought from the national committees for science. Delegates for 2010 are listed in Appendix 2.

InterAcademy Panel: the global network of science academies

The InterAcademy Panel (IAP), the global network of over 100 science academies, is committed to assisting member academies in working together to advise citizens and public officials on the scientific aspects of critical global issues. IAP is especially interested in assisting young and small academies achieve these goals. The Academy has been appointed for a second term on the IAP executive committee for the term 2010 to 2012.

IAP provides access to links and networks to assist member academies in raising their public profile

Table 3

Scientific organisation	Office holders	Office
IAU – astronomy	Professor Matthew Colless FAA	Vice-President
World Climate Research Programme	Professor Dave Griggs	Vice-President
URSI – radio science	Professor Phil Wilkinson	Vice-President
SCOSTEP – solar-terrestrial physics	Professor Bob Vincent FAA	President
IUGG – Earth sciences	Dr Tom Beer	President
IUGG (IASPEI) – Earth sciences	Professor Ian Jackson	Vice-President
IGU – geography	Professor Ruth Fincher	Vice-President
IUCr – crystallography	Professor Peter Colman FAA	Vice-President
IUIS – biomedical sciences	Professor Peter Doherty FAA	President
ICO – spectroscopy	Professor Min Gu FAA	Vice-President
INQUA – quaternary research	Professor Allan Chivas FAA	President
IACS – Earth system science	Dr Ian Allison	President
IUPAB – physics	Professor Cris Dos Remedios	Secretary General
IUPAC – chemistry	Professor David Black FAA	Secretary General

among citizens and their influence among policy makers. IAP organises international conferences, sponsors workshops and serves as a forum for the exchange of ideas and experience among academies. It helps these bodies to achieve greater recognition and public presence within their nation and region.

IAP's flagship program focuses on capacity-building for science academies, particularly those academies in developing countries. In addition, IAP supports projects that are coordinated by member academies and regional networks. The current strategic plan outlines three objectives for IAP:

- to position IAP as a widely recognised provider of high quality, independent global science advice to governments and international organisations
- to support major programs on scientific capacity building, science education and science communication
- to assume a lead role in efforts to improve the effectiveness and impact of international cooperation in science.

Professor Jenny Graves, the Academy's Secretary for Education and Public Awareness, attended the 2010 executive committee meeting in November 2010 in Santiago, hosted by the Chilean Academy of Science.

The spring 2011 IAP executive committee meeting was attended by Professor Andrew Holmes AM FAA, Foreign Secretary for the Academy, in March 2011 in Washington, DC, hosted by the US National Academy of Sciences.

InterAcademy Council

The InterAcademy Council (IAC) engages the world's leading researchers to advise international bodies such as the United Nations (UN) and the World Bank on current global issues of concern. The IAC cooperates closely with the IAP with current areas of focus being water supply and quality and infectious diseases.

The governing board of the IAC comprises 15 academies of science and equivalent organisations including the Australian Academy of Science, representatives of the IAP, the International Council of Academies of Engineering and Technological Sciences and the InterAcademy Medical Panel, as well as the African Academy of Sciences and the Academy of Sciences for the Developing World.

In 2010 the IAC undertook an independent review of the processes and procedures of the Intergovernmental Panel on Climate Change (IPCC) at the request of the Secretary General of the UN. A special committee produced a draft report which was reviewed by 12 international experts and monitored by IAC Board members Professor Ralph Cicerone, President of the National Academy of Sciences, and Professor Kurt Lambeck. The report released on 30 August 2010 concluded that the process employed by the IPCC had been successful overall but recommended a range of reforms particularly in relation to management structures to strengthen procedures.

The Academy was represented by Professor Andrew Holmes at the IAC Board meeting which took place in conjunction with the IAC executive committee meeting in Washington, DC in March 2011.

Federation of Asian Scientific Academies and Societies

The Federation of Asian Scientific Academies and Societies (FASAS) was established in 1984 and currently has a membership of 15 scientific academies and societies from the Asia region. The objectives of FASAS are the promotion of science and technology and the organisation of national and regional programs for the development of member countries. In particular, FASAS emphasises the importance of science and technology for development in the region and the integration of science and technology into national development planning and policy making processes.

The Academy's past president Professor Kurt Lambeck is the current President of FASAS for the period 2010 to 2012, during which time the Academy is providing the FASAS secretariat. During his tenure, Professor Lambeck intends to focus on increasing awareness of the importance of science

literacy and science education, and interactions between the groupings of science academies and organisations in the regions.

Professor Lambeck and Nancy Pritchard, Manager International Programs, attended the 2010 council meeting in Seoul, Korea on 21 October 2010. This meeting was held in conjunction with the 2010 General Assembly of the Association of Academies of Sciences in Asia (AASA) and the Fourth AASA–FASAS Joint International Symposium on Science Education in the Pacific.

More information about FASAS is available at **www.fasas.org.au**

FASAS President Kurt Lambeck (second from right) at the 2010 FASAS council meeting in Seoul

Bilateral activities

The Academy's extensive national and international networks enable the organisation of bilateral workshops in key areas of science and technology identified as priorities under the Australian Government's Department of Innovation, Industry, Science and Research International Science Linkages program. These provide forums for senior Australian researchers and government officials to meet with their counterparts to identify areas of mutual research interest and establish and strengthen long-term relationships.

■ EUROPE

Cooperation in Science and Technology (COST) activities

More information on COST may be found at **www.cost.esf.org**

COST training school on cyberbullying

Australia was invited to host the first COST training school in the area of cyberbullying in Melbourne from 11 to 16 April 2010, as it is seen as a leader in this area of research. Thirty researchers from COST countries and 30 Australian researchers attended the training school, which included lectures, workshops, roundtable discussions and presentations. The Australian convener of the workshop was Professor Phillip Slee of Flinders University. Professor Tony Klein FAA spoke at the opening of the workshop on behalf of the Academy and noted the importance of international collaborations to tackle global problems including cyberbullying. Nancy Pritchard, Manager International Programs, and Australian Government officials met with COST office representatives during the meeting to discuss the program.

Cost workshop

The Academy organised a COST workshop at the Shine Dome on 16 March 2011 attended by 30 Australian researchers with links to COST Actions, with funding from DIISR. The aim of the workshop was to identify the key drivers of successful Australian engagement with COST Actions in order that any future related programs start from a solid knowledge base.

More information may be found at **science.org.au/internat/bilateral-activities.html**

11th Australia–European Union Joint Science and Technology Cooperation Committee mobility workshop

The Academy was invited to host the 11th Australia–European Union Joint Science and Technology Cooperation Committee (JSTCC) mobility workshop on 7 June 2010. This meeting was part of a JSTCC program of events, which included six thematically focused workshops hosted by Australian science and research institutions and a 'horizontal' policy roundtable discussion.

The meeting was held at the Shine Dome and chaired by Professor Franz Grieser FAA of the University of Melbourne. The meeting was attended by academics and Australian Government representatives. Dr Martin Grabert, former director of COST, was also in attendance.

The meeting recognised the mutual interests and priorities in science and technology between Australia and the European Commission and reaffirmed the commitment of both parties to science and technology cooperation and building strong foundations for a profitable relationship.

COST Workshop participants at the Shine Dome

■ ASIA

China

Celebrating 30 years of Australia–China science and technology relations

Shanghai World Expo and Australia and China Science and Technology Week

Thirty years of scientific and research cooperation between China and Australia was celebrated at the Shanghai World Expo during Australia and China Science and Technology Week from 2 to 6 August 2010.

PHOTO: DIISR

Dr Jim Peacock speaking at the Shanghai World Expo in August

A diverse program titled *Partners for a better future* commenced with an Australia–China astronomy roundtable, chaired by the Chief Scientist for Australia, Professor Penny Sackett. Dr Brian Boyle FAA, Director of the CSIRO Square Kilometre Array (SKA), and Professor Elaine Sadler FAA, chair of the Academy's National Committee for Astronomy, participated in the astronomy roundtable between Australia and China on 2 August with the aim of cultivating productive and long-term relationships between astronomers from both countries.

This was followed by three workshops aimed at promoting new collaborations between Australian and Chinese researchers in areas of common research interest and strength.

Professor Robin Batterham FAA and President of the Australian Academy of Technological Sciences and Engineering (ATSE) presided at the opening ceremony of the *Impacts of climate change on future urban societies* workshop on 3 and 4 August, which included presentations by Australian and Chinese experts in urban planning, water management, environmental science, human health and climate science.

Past president Dr Jim Peacock FAA presided at a joint opening of concurrent biotechnology and nanotechnology workshops on 5 and 6 August. Professor John Shine FAA and Professor Charles McKay FAA presented at the *Biotechnology improving food production and food quality and human health* workshop and Professor Frank Caruso FAA, Professor Chennupati Jagadish FAA and Professor Michelle

Australia–China symposium delegates on a site visit

Simmons FAA presented at the *Nanotechnology benefiting society* workshop.

Both workshops examined the potential of these emerging technologies to contribute to economic and social benefits, including improved energy efficiency, human health outcomes and sustainable production.

The Academy and ATSE assisted DIISR to organise these events, in collaboration with the Chinese Academy of Sciences (CAS), the Science and Technology Commission of Shanghai Municipality and the Shanghai Association of Science and Technology.

Seventh Annual Australia–China Symposium on Agriculture and Food Security Relating to Health

Ideas were shared and connections were formed at the Seventh Annual Australia–China Symposium on Agriculture and Food Security Relating to Health from 14 to 16 November 2010. The Academy, in conjunction with ATSE and CAS, organised the event on behalf of DIISR. The venue for the symposium was the Barossa Valley in South Australia.

The intense symposium involved 50 Australian and Chinese researchers and was jointly opened by the three Academy presidents, CAS's Professor Yongxiang Lu FAA, ATSE's Professor Robin Batterham and the Academy's Professor Suzanne Cory.

PHOTO: ID PHOTOGRAPHICS, IRENE DOWDY

Yongxiang Lu and Kim Carr enjoying dinner at the Shine Dome

The workshop participants explored collaborative opportunities during plenary discussions and presentations in three concurrent workshops:

- climate change impacts on food security
- food safety, food nutrition and human health
- agricultural productivity, biosecurity and future demand for food.

Each workshop was jointly convened by senior Australian and Chinese expert researchers. The two-day symposium preceded a day of site visits for the Chinese delegation at the University of Adelaide's Waite Campus and South Australian Research and Development Institute.

As a direct result of the symposium, DIISR has provided funding for three follow-up workshops to occur on focused topics that were deemed important and worthy of follow-up at the symposium. These workshops will take place in China and Australia in 2011.

Following the opening of the Australia–China symposium, Professor Lu undertook a week-long schedule of official visits, accompanied by Academy staff and a delegation of senior CAS representatives. Professor Lu was the guest of honour at a public lecture and dinner at the Shine Dome to celebrate the 30 year anniversary in Australia, co-hosted by Academy President, Professor Suzanne Cory, and Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research. Guests included 2011 Australian of the Year, Simon McKeon, and His Excellency Yuming Chen, Ambassador for the People's Republic of China.

Professor Lu presented a lecture entitled *Science and technology for a green, smart and sustainable future*, stressing China's view of the valuable contribution that science and technology can make in addressing the global challenges in a changing world.

Whilst in Canberra, Professor Lu attended the award ceremony for the Prime Minister's Prize for Science as the Prime Minister's guest at Parliament House and met with the Foreign Minister, the Hon Kevin Rudd. He also signed memoranda of understanding with the Universities of Sydney and Adelaide and visited the CSIRO's Division of Food and Nutritional Sciences.

Australia–China next step initiative

The Academy, in conjunction with ATSE, organised the *Australia–China next step initiative* in Australia from 3 to 7 May 2010. Funded by the Australia–China Council of the Department of Foreign Affairs and Trade, the *Next step initiative* provides an opportunity for Australian and Chinese researchers previously involved in the Academies' symposia series organised with CAS, to meet with their counterparts to explore and further develop the collaborative opportunities that may lead to a series of bilateral relationships.

Six Chinese researchers travelled to Australia to meet with their potential research partners. Participants reported on a number of exciting collaborative outcomes, such as:

- understanding the connectivity between marine environments in the South China Sea and northern Australia
- modelling for carbon accounting in forest and agriculture zones
- comparative studies of planning and management for rapid growth and climate change in south-east Queensland and the Yangtze river delta
- coastal management via monitoring decadal trends of algal blooms
- a clean crops initiative to understand metal contamination and toxicological impacts in order to minimise risk
- bioremediation of emerging contaminants in Australia and China
- urban expansion
- regional vulnerability and resilience.

Indonesia

Australia–Indonesia Agriculture and Food Security Workshop

The Academy and the Indonesian Ministry of Research and Technology (RISTEK), on behalf of the Australian Government Department of Innovation, Industry, Science and Research, organised the *Australia–Indonesia agriculture and food security workshop* in Canberra on 8 and 9 June 2010.

The Indonesian delegation was led by Dr Listyani Wijayanti, Advisor to the Minister of Research and Technology for Food and Health Technology. Professor Jim Fox, from the Resource Management in Asia-Pacific Program (RMAP) at the Australian National University and an Indonesian expert, was

Participants of the Austalia–Indonesia Agriculture and Food Security Workshop at the Shine Dome

PHOTO: HOWARD MOFFAT (AUSPIC)

President of the Mongolian Academy of Sciences Batbold Enkhtuvshin (far left) and Academy President Suzanne Cory (far right) signed a MoU formalising scientific linkages between the two academies. Pictured here with Mongolian Prime Minister, Batbold Sukhbaatavyu (centre left) and Prime Minister Julia Gillard (centre right)

the Australian co-convenor and led a delegation of 10 prominent scientists in the fields of agriculture and food security.

The workshop participants explored collaborative opportunities during plenary discussions and presentations in the areas of rice, sugarcane, beef cattle, soybeans, maize and sorghum.

The two-day workshop was followed by a day of site visits for the Indonesian delegation at the University of Sydney's Plant Breeding Institute.

Mongolia

Memorandum of understanding with Mongolia

In a ceremony attended by Prime Minister Julia Gillard, the President of the Academy, Professor Suzanne Cory, and the President of the Mongolian Academy of Sciences, Professor Batbold Enkhtuvshin signed a memorandum of understanding on 22 February for greater understanding and sharing of ideas between scientists in Australia and Mongolia. The memorandum formalises scientific linkages between the two academies and is expected to help Australian and Mongolian scientists connect with one another and strengthen ties with Mongolian scientists by exchanging ideas and reviewing collaborative opportunities in fields of common scientific interest including natural resources and agriculture.

The Mongolian Academy of Sciences joins 18 other international science organisations having formal relationships with the Australian Academy of Science.

Singapore

Second Singapore–Australia joint symposium on stem cells and bioimaging

The Academy, in collaboration with the Singaporean Agency for Science, Technology and Research (A*STAR), organised the second *Singapore–Australia joint symposium on stem cells and bioimaging*, held in Singapore on 24 and 25 May 2010.

Dr Alan Colman of the Singapore Stem Cell Consortium and Professor Bob Williamson FAA co-convened the symposium, which included 11 Australian and nine Singaporean speakers. Participants took the opportunity to conduct a program of technical visits to the Singapore Bioimaging Consortium. The first Australia–Singapore joint symposium was held in Canberra in 2009 on the topic of energy. It is expected that these meetings will foster greater collaborations between researchers from both countries.

Support for international collaborations

The Academy's programs for international scientific and technological collaborations aim to improve Australian access to global science and technology and to increase awareness of Australian research. These programs provide Australian researchers with opportunities to broaden their research experience, develop collaborations with overseas colleagues on international projects, develop experience and knowledge in techniques that will advance Australian research and gain international recognition. Some programs also support visits to Australian research organisations by overseas researchers with similar benefits.

Scientific visits program

The Australian Government funds the Academy's program of scientific visits through DIISR's International Science Linkages – Science Academies Program which provides funding for living and travelling costs.

This program has been in existence since the International Science Linkages was established in 2001 and a booklet featuring case studies of some of the outstanding achievements of the collaborative projects that have resulted from the funding is available at **science.org.au/internat/documents/SuccessStoriesISL.pdf**.

During the reporting period the scientific visits program supported 69 Australian scientists to undertake short-term visits to research institutions in Europe, North America and Asia, and for 23 Asian researchers to come to Australia. Further information is contained in the appendices indicated in Table 4.

Full details of the programs are available at **science.org.au/internat**

Europe

DIISR has an international science and technology agreement with the European Commission that enables Australian researchers to access European Framework Programme funding. The Academy administered the following activities with funding from the strategic investment component of DIISR's International Science Linkages program.

Cooperation in Science and Technology (COST)

Australian researchers are eligible to join COST Actions under an agreement between the Academy and the COST office in Brussels. COST enables Australian researchers to access European sources of funding, expertise and facilities.

A full list of the researchers supported by the scheme and further details are available in Appendix 9.

International Research Staff Exchange Scheme

The Marie Curie International Research Staff Exchange Scheme (IRSES) was introduced into the Seventh Framework Programme in 2008 to strengthen research partnerships through short-term staff exchanges and networking activities between European research organisations and organisations from countries with which the European Commission has a science and technology agreement, including Australia. The European Commission provides support for the travel and living costs of European staff travelling to Australia.

A full list of the 12 researchers supported by the scheme and further details are available in Appendix 10.

Australia–Germany Researcher Mobility and Solar Photovoltaics Research funding

The Australia–Germany Researcher Mobility and Solar Photovoltaics Research funding supports

Table 4

Country	Number funded	To	From	Appendix
Europe	27	27 *	N/A	3
North America	20	20	N/A	4
China	25	9	16	5
Japan	_	0	4	6
Korea	6	3	3	7
Taiwan	10	10	N/A	8

* The Embassy of France in Australia also provided generous travel funds for the top six grant recipients selected to visit France.

travel and research costs during the initial stages of collaborative research projects. This one-off funding is aimed at facilitating bilateral research projects between Australia and Germany in these fields.

A full list of the 22 researchers supported by this funding program and further details are available in Appendix 11.

Other sponsors

Other sponsors of the Academy's international collaborations programs include overseas governments and donors who generously support individual travelling fellowships.

Embassy of France cotutelle program

The Academy has administered the cotutelle postgraduate fellowships program on behalf of the Embassy of France in Australia since 2002. The program operates in Australia and France and is designed to promote two-way international research collaboration. Cotutelle PhD students work under the direction of thesis supervisors in two institutions, and each project is established under a reciprocal arrangement. A 'cotutelle convention' binds the two partner institutions and recognises the validity of the studies undertaken. If successful, a double-badged degree is awarded to the student.

Three Australian and two French PhD students were supported under this activity during the reporting period.

Rod Rickards fellowship

This award was established in 2009 by the family of Professor Rod Rickards FAA to honour his important contributions to Australian science through achievements in the chemistry of compounds of medical, biological, agricultural and veterinary importance. The award provides funds for researchers to travel to Europe to undertake research in the area of chemistry or biology.

Two researchers were awarded the Rod Rickards fellowship in 2010–11; Dr Justin Boddey of the Walter and Eliza Hall Institute of Medical Research and Professor Barbara Messerle of the University of Sydney. Dr Boddey will collaborate with Dr Maria Mota of the Institute of Molecular Medicine in Portugal on the project *Protein export by malaria parasites during liver cell infection*. Professor Messerle will undertake visits with Professor Odile Eisenstein at the Institut Charles Gerhardt in France and Professor Stuart Macgregor of Heriot-Watt University in the UK. Professor Messerle's research project focuses on *Rational design of bimetallic catalysts for efficient synthesis*.

Bede Morris fellowship

This award is supported by family and friends of the late Professor Bede Morris FAA, in honour of his contribution to research in immunology and Australian–French relations. The award supports one outstanding scientist each year to travel to France to undertake research.

The recipient of the Bede Morris fellowship in 2011 is Associate Professor Ian Anderson of the University of Western Australia's Centre for Plants and the Environment. Professor Anderson will undertake a research project titled 'New insights into the eucalypt *Pisolithus symbiosis* via bioinformatics analysis of transcriptomic and genomic data' at the National Institute for Agricultural Research (INRA), France.

Japan exchanges

The Japan Society for the Promotion of Science (JSPS) is an independent administrative institution for the purpose of contributing to the advancement of science. JSPS is largely funded by the Japanese government and plays a pivotal role in the administration of a wide spectrum of Japan's scientific and academic programs. The Academy's role in administering the fellowships is supported by DIISR's International Science Linkages – Science Academies Program. Depending on the number of Australian participants, support from JSPS can amount to $2 million per year.

JSPS postdoctoral fellowships provide opportunities for Australian postdoctoral researchers to conduct cooperative research with leading research groups in universities and other Japanese institutions. The program aims to help such researchers advance their own research while contributing to the advancement of research in Japan and the counterpart countries.

A full list of the 12 researchers supported by this program and further details are available in Appendix 12. The JSPS short-term invitational fellowships (Appendix 13) and long-term invitational fellowships (Appendix 14) allow researchers employed at designated Japanese research institutions and universities to invite fellow researchers from Australia to Japan to undertake

2010 East Asia and Pacific Summer Institutes (EAPSI) summer program students at an orientation session at the Shine Dome

collaborative research, to participate in discussions, attend seminars, give lectures or perform similar functions at their research institutions.

North America

2010 US summer program in Australia

The Academy hosted 20 American PhD students selected to participate in the 2010 East Asia and Pacific Summer Institutes (EAPSI) summer program, managed by the Academy and the US National Science Foundation (NSF).

The 2010 program was the seventh to be held in Australia and enables science and engineering students to visit between June and August each year for a period of eight weeks during the American summer in order to undertake research in laboratories and to initiate personal relationships with their Australian counterparts.

The Academy organised a series of lectures and site visits to cultural institutions as part of the orientation session. Dr Sue Meek, Chief Executive of the Academy, welcomed the group to the Academy during the orientation session. Professor Jenny Graves delivered a presentation on Australian mammals and Dr Joe Hlubucek, past executive director of the Australian–American Fulbright Commission, spoke about postdoctoral research opportunities in Australia. Dr Martin Callinan, the Academy's Science Policy Manager, presented on science policy in Australia.

This activity is funded by DIISR's International Science Linkages Program.

A full list of researchers supported by the program and further details are available in Appendix 15.

Adam J Berry Memorial Fund

The Adam J Berry Memorial Fund is co-managed on behalf of the Berry family by the Academy and the US National Institutes of Health Foundation.

PHOTO: VICTORIA HEWITT

Victoria Hewitt at the bench

It assists one Australian early career researcher to travel or work in the USA at one of the institutes of the National Institutes of Health each year. In addition to gaining valuable research experience, recipients are expected to make a contribution to the research program of the institution to which they are temporarily attached. Professor Jonathan Stone FAA chairs a special committee that assesses and recommends suitable candidates for this award.

Victoria Hewitt of Monash University's Department of Biochemistry and Molecular Biology was selected as the 2011 recipient of the Adam J Berry Memorial Fund award. Victoria will undertake research on 'Exploring the insertion machinery of mitochondrial outer membrane proteins' under supervision of Dr Susan Buchanan at the US National Institute of Diabetes and Digestive and Kidney Diseases.

Academy medals and lectures

THE RECOGNITION OF OUTSTANDING CONTRIBUTIONS TO THE ADVANCEMENT OF SCIENCE IS CENTRAL TO THE PURPOSE OF THE ACADEMY. AWARDS FOR DISTINGUISHED RESEARCH ARE MADE TO CAREER RESEARCHERS FOR CONTRIBUTIONS MADE DURING THEIR WORKING LIVES, AND FOR OUTSTANDING ACHIEVEMENTS BY EARLY CAREER RESEARCHERS UNDER THE AGE OF 40.

Career award recipients

The 2011 honorific awards for scientific excellence were awarded to the following career researchers:

- **Matthew Flinders Medal and Lecture**: Professor Brian Kennett FAA, Australian National University
- **David Craig Medal for research in chemistry**: Professor Ian Dance FAA, University of New South Wales
- **Hannan Medal for research in applied mathematics and computational mathematics**: Professor Colin Rogers FAA, University of New South Wales
- **Jaeger Medal for research in the Earth sciences**: Professor Ian Jackson, Australian National University
- **Thomas Ranken Lyle Medal for research in mathematics or physics**: Professor James Stanislaus Williams FAA, Australian National University

Early career award recipients

- **Fenner Medal for research in biology** (excluding the biomedical sciences): Dr Bryan Fry, University of Melbourne

Brian Kennett

Ian Dance

Colin Rogers

Ian Jackson

James Williams

Bryan Fry

Alicia Oshlack

Stuart Tangye

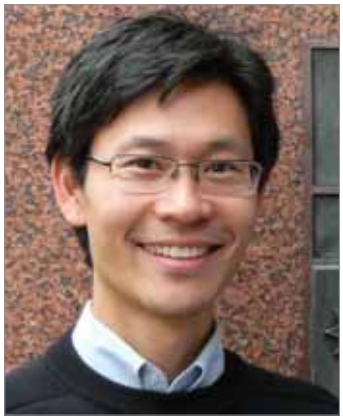
Craig Simmons

Anthony Henderson

Kirsten Benkendorff

Martina Stenzel

Scott Sisson



Mark Tanaka

Bryan Gaensler

- **Ruth Stephens Gani Medal for research in human genetics**: Dr Alicia Oshlack, Walter and Eliza Hall Institute of Medical Research
- **Gottschalk Medal for research in the medical sciences**: Dr Stuart Tangye, Garvan Institute of Medical Research
- **Anton Hales Medal for research in the Earth sciences**: Professor Craig Simmons, Flinders University
- **Inaugural Christopher Heyde Medal for research in pure mathematics**: Dr Anthony Henderson, University of Sydney
- **Dorothy Hill Award for female researchers in the Earth sciences**: Dr Kirsten Benkendorff, Southern Cross University
- **Le Fèvre Memorial Prize for research in basic chemistry**: Associate Professor Martina Stenzel, University of New South Wales
- **Moran Medal for research in statistics**: Dr Scott Sisson, University of New South Wales; Dr Mark Tanaka, University of New South Wales
- **Pawsey Medal for research in physics**: Professor Bryan Gaensler, University of Sydney

Research support and travelling fellowships

THE ACADEMY PROVIDES FUNDING SUPPORT TO EARLY CAREER RESEARCHERS FOR INDIVIDUAL RESEARCH PROJECTS IN AUSTRALIA, AND TRAVELLING FELLOWSHIPS TO ENABLE DISTINGUISHED OVERSEAS AND AUSTRALIAN SCIENTISTS TO VISIT SCIENTIFIC CENTRES AND INFORM THE COMMUNITY MORE BROADLY THROUGH PUBLIC LECTURES.

Research support

2011 Margaret Middleton fund for endangered Australian native vertebrate animals

The following researchers will receive support for their research into the conservation biology of vertebrate animals native to Australia:

- **Greta Frankham**, University of Melbourne. The phylogeography and population genetics of the long-nosed potoroo *Potorous tridactylus*
- **Dr Michael Letnic**, University of Western Sydney. How do dingoes provide conservation benefits for the dusky hopping mouse *Notomys fuscus*
- **Dr Adam Polkinghorne**, Queensland University of Technology. Towards an effective conjugate vaccine to combat debilitating chlamydial disease in the koala
- **Qamar Schuyler**, University of Queensland. Sea turtles threatened by marine debris: do they have a choice in the matter?
- **Dr Arian Wallach** and **Dr Adam O'Neill**, C&A Environmental Services. Restoring ecosystem function from the top

WH Gladstones population and environment fund grants

The fund supports empirical research into the effect of Australia's population on the environment in terms of health, well-being, the economy and security:

- **Dr Daniel Ramp**, University of New South Wales. Engagement of a growing Australian population with kangaroos – modelling for sustainable futures

Reports on 2010 travelling fellowships

The following distinguished researchers undertook travel for their 2010 fellowships:

2010 Graeme Caughley travelling fellowship (ecology)

Professor David Bowman
Professor of Forest Ecology, School of Plant Science, University of Tasmania

Professor David Bowman has contributed significantly to research in extinction of Australia's

Pleistocene megafauna and in the ecology of extant large herbivores in northern Australia, and has undertaken transdisciplinary research programs designed to sustainably manage biodiversity and ecosystem services in northern Australia.

Professor Bowman attended the 8th Savanna science network meeting held at Kruger National Park in April 2010 and presented a paper entitled *Feral Asian water buffalo in Kakadu National Park, Australia – the ecology and management of Australia's 'new megafauna'*. Dr Bowman also studied the landscape ecology of the Kruger Park, and looked at population structures of the African baobab *Adansonia digitalis*.

2010 Rudi Lemberg travelling fellowship (biological sciences)

Professor Johann Deisenhofer
Virginia and Edward Linthicum Distinguished Chair in Biomolecular Science and Regental Professor, University of Texas Southwestern Medical Center

As the 2010 Rudi Lemberg Fellow, Professor Deisenhofer presented a range of lectures and seminars in Brisbane, Canberra, Sydney and Melbourne during September 2010, placing special emphasis on providing opportunities for informal meetings with junior researchers and students.

Professor Deisenhofer is an eminent structural biologist and 1988 Nobel Laureate in Chemistry, a prize he was awarded jointly with Robert Huber and Hartmut Michel for the determination of the three-dimensional structure of a photosynthetic reaction centre.

2010 Selby fellowship (all sciences)

Professor Peter Sadler
Professor of Chemistry and Head of Department, University of Warwick

The 2010 Selby Fellow, Professor Peter Sadler FRS, Professor of Chemistry at the University of Warwick, is an eminent international authority in the field of medicinal inorganic chemistry, particularly in relation to the mode of action of anti-cancer drugs.

During August and September Professor Sadler presented 11 public lectures in Brisbane, Sydney, Wollongong and Melbourne on *The elements of life and medicines*. He also presented specialist lectures in medicinal organic chemistry and biological magnetic resonance spectroscopy, providing an opportunity to bring together Australian researchers of metals in biology for an inaugural meeting.

2011 travelling fellowships

The following scientist was awarded a fellowship for 2011:

2011 Selby fellowship

Professor Dame Julia Higgins, Imperial College, London

Research conferences

THE ACADEMY SUPPORTS CONFERENCES THAT BRING TOGETHER RESEARCHERS AT THE FOREFRONT OF SCIENCE TO DISCUSS FUTURE DIRECTIONS IN THEIR FIELDS.

Reports on research conferences held in 2010

2010 Fenner conference on the environment

Healthy climate, planet and people: co-benefits for health of action on climate change

23 and 24 June 2010, Shine Dome, Canberra
Organised by Professor Anthony Capon, and Professor Janette Lindesay, Australian National University

Climate change affects health in many ways. In Australia, there are health impacts from more frequent and severe extreme weather events, such as heat waves and tropical storms, and indirect health impacts from changes to physical and biological processes, such as enhanced health risks from urban air pollution. There are also flow-on health impacts from social, demographic and economic disruptions, such as declining rural incomes from agricultural production.

Responses to climate change can also affect health. These health impacts are mostly positive and have been called 'health co-benefits'. Examples of health co-benefits include those arising from active modes of travel (walking, cycling, mass transit), a vegetable-rich diet, and renewable energy generation. Such actions increase exercise and improve nutrition and air quality, while also reducing greenhouse gas emissions. There are benefits to both physical and mental health.

More than 150 participants from research, policy, practice and industry joined the conference to interact with leading Australian and international researchers.

The conference was organised by a team led by the National Centre for Epidemiology and Population Health at the Australian National University, with support from the CSIRO Climate Adaptation Flagship and the National Climate Change Adaptation Research Facility.

Following the conference, delegates enjoyed *The contested landscapes of western Sydney* at the adjacent Australian National University School of Art. This exhibition of visual art is from an art and science collaboration led by John Reid.

The conference has now stimulated new research collaborations and policy interest.

Recordings of the proceedings, and copies of presentations, are available from **nceph.anu.edu.au/Fenner2010/index.php**

Conference announcements for 2011

2011–12 Boden research conference

Bacterial cell biology: new insights on host-pathogen interactions 11 to 14 October 2011,

Fenner Conference on the Environment 2010 participants with Frank Fenner (seated) outside the Shine Dome

Shine Dome, Canberra. Organised by Professor Trevor Lithgow FAA, Monash University and Professor Jennifer Stow, University of Queensland

2011–12 Elizabeth and Frederick White research conference

Evolution of photosynthesis and oxygenation of Earth 28 and 29 June 2011, University of New South Wales, Sydney. Organised by Professor Anthony Larkum, University of Sydney; Professor Brett Neilan, University of New South Wales and Professor Malcolm Walter FAA, University of New South Wales

More information on research conferences is available at **science.org.au/awards/research-conferences.html**

Public awareness and outreach

THE ACADEMY SUPPORTS A RANGE OF ACTIVITIES AND EVENTS THAT AIM TO PROMOTE UNDERSTANDING OF SCIENCE AND FOSTER GREATER AWARENESS OF SCIENCE RELATED ISSUES AND ACTIVITIES IN GOVERNMENT, INDUSTRY, THE MEDIA, ACADEMIA AND THE COMMUNITY.

Science at the Shine Dome

The Academy's annual Science at the Shine Dome event was held from 5 to 7 May 2010. The event incorporates the annual general meeting, induction of new Fellows, presentation of awards and a scientific symposium.

Academy Fellows and then president Professor Kurt Lambeck, were joined by newly elected Fellows, Academy award winners, early career researchers, science teachers, and interested members of the public. Seventeen scientists from all fields of science were admitted as new Fellows of the Academy and spoke about their groundbreaking research. Winners of the Academy's 2010 career and early career researcher awards were presented with their medals and discussed their latest work.

The proceedings concluded with a one-day *Genomics and mathematics* symposium. The symposium brought together scientists working in both fields, to discuss the need for co-evolution of computational, mathematical and statistical methods to store, analyse, interpret and manage the exponential increase in data being generated by rapidly evolving genomic technologies.

Professor Terry Speed FAA of the Walter and Eliza Hall Institute of Medical Research set the scene by explaining the fundamentals of the technology and introduced a program featuring nine speakers, including international guest speaker Professor Simon Tavaré of the University of Cambridge who compared the extremes of variation in high-dimensional data in genome-wide association studies.

More information about the symposium is available from **science.org.au/events/sats/sats2010/symposium.html**

Launch of *A big bold simple concept*

The 50th anniversary of the opening of the Dome, celebrated at the Academy during October 2009, has been documented in a new publication *A big*

Open Day activities for children were well received

bold simple concept by Dr Alan Roberts, historian and author. The Academy asked Alan to write about the Dome's design, construction and history. His extensive research revealed previously unknown or forgotten information about the Dome from numerous archival collections. Features of the Dome's architecture from its conception to construction and renovation are all in the book, providing insight into a remarkable building and the people who brought it into being.

The book was launched in April by prominent local architect Roger Pegrum and speakers included then president, Professor Kurt Lambeck and Dr Roberts.

The book is available for purchase from **science.org.au/publications/history-and-biographies.html**

Open Day September 25

On 25 September the doors to the Shine Dome were opened to the public once again. This year the focus of the day was celebrating women in science.

L'Oréal Australia: For Women in Science awardee Dr Rowena Martin gave an engaging short lecture about drug resistance in the human malarial parasite. Professor Marilyn Ball FAA gave a talk about the paradoxical response of plants to climate change that was also well received. Audience members were surprised and intrigued to learn that there is evidence for an increase in frost damage in warming climates! Two short films from the Academy's *Interviews with Australian scientists* collection were also shown, profiling early career scientists and 2010 Academy honorific award winners Dr Amanda Barnard and Dr Nicole Webster.

In partnership with the University of Queensland and the Queensland Museum, the Academy was able to display artefacts from the life and scientific career of past president Professor Dorothy Hill AC CBE FAA FRS. Items on display included her field kit, fossilised coral samples and school book prize. Dorothy Hill's former PhD student, Emeritus Professor Ken Campbell FAA, was also on hand to share his memories of Professor Hill. L'Oreal also provided displays, books and information on its L'Oreal Australia and L'Oreal-UNESCO For Women in Science awards.

Also speaking on the day was the Academy's 2010 Mawson Medal winner, Professor Patrick De Deckker AM, with his lecture entitled *Understanding Canberra's dust storms*.

The children's program for the day was very successful, with a Shine Dome treasure hunt and face painting. Questacon's Dr Scar taught visitors about the science of wounds and healing. Displays and experiments from the Academy's education programs *Primary Connections* and *Science by Doing* proved popular as were guided tours of the Shine Dome offered throughout the day, conducted by

architects John Armes and David Hobbes, and Academy librarian Rosanne Walker, giving each tour a different flavour and focus. Over 250 people visited during Open Day this year.

Public lecture series

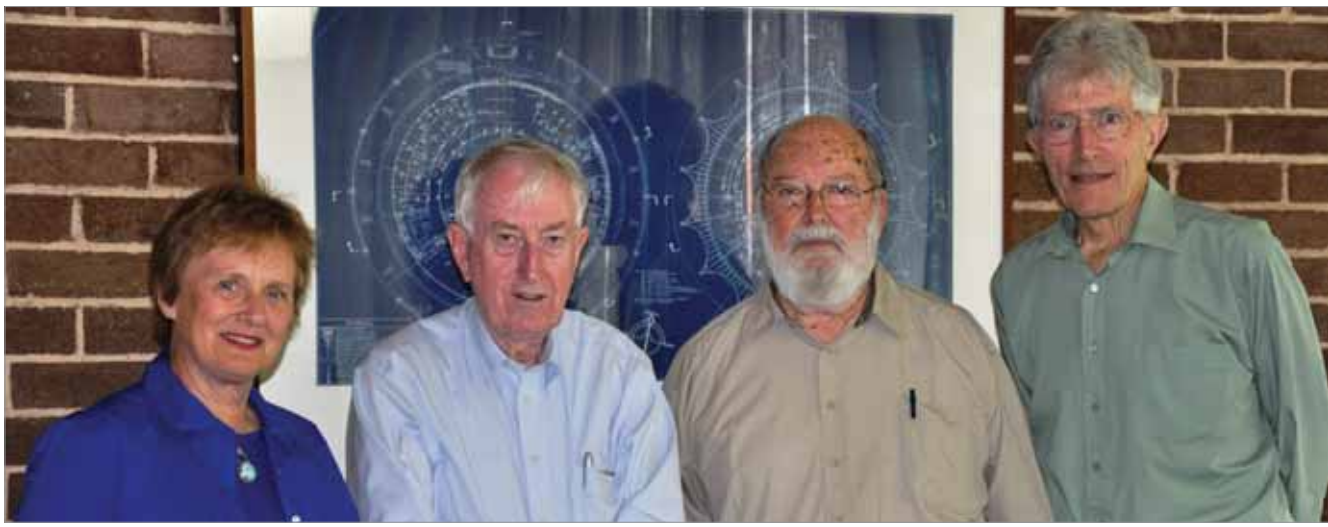
Water management options for urban and rural Australia

The Academy's public lecture series began in September 2009 and concluded in December 2010. *Water management options for urban and rural Australia* aimed to inform debate and action on Australia's future water security by exploring the role of science in understanding the location and amounts of water we have, in predicting how supply and demand may change into the future, and in developing technical responses and improved management techniques. It also examined situations where such information is brought together to provide practical and environmentally responsible solutions.

The lectures in the water series from April to December 2010 were:

- **6 April** 'Water reform in Australia'. Ken Matthews AO, Chair and Chief Executive Officer, National Water Commission
- **1 June** 'Recycling stormwater – new urban water supplies using aquifer recharge'. Dr Peter Dillon, CSIRO Land and Water, CSIRO Water for a Healthy Country Flagship
- **6 July** 'The water dance'. Adjunct Professor Leith Boully, Centre for Ecological Economics and Water Policy, University of New England
- **3 August** 'The spin and economics of irrigation infrastructure policy in Australia'. Professor Lin Crase, Professor of Applied Economics, Executive Director of Albury-Wodonga Campus, La Trobe University
- **7 September** 'Aboriginal knowledge and cultural values of water'. Bradley Moggridge, Indigenous Water Research Project Officer, CSIRO Land and Water
- **5 October** 'The changing face of the urban water industry in the context of cities of the future'. Ross Young, Executive Director, Water Services Association of Australia
- **2 November** 'Groundwater challenges and opportunities for Australia in the 21st century'. Professor Craig T Simmons, Professor of Hydrogeology, Flinders University, Director of National Centre for Groundwater Research and Training

Barry Hart at the final lecture in the *Water management options for urban and rural Australia* series



Suzanne Cory, Peter Doherty, Henry Nix and Adrian Gibbs at the Frank Fenner tribute symposium

- **7 December** 'Australian water reform – the Murray-Darling Basin plan'. Professor Barry Hart, Director of Water Science Pty Ltd, Emeritus Professor at Monash University

Transcripts and slides from the series are available from **science.org.au/events/publiclectures/wm/index.html**

Fenner's science today and tomorrow

In February 2011, the Academy commenced a new public lecture series dedicated to the late Professor Frank Fenner AC FAA FRS with a tribute symposium to his contributions to areas of research that he pioneered. Frank Fenner's long and diverse career spanned many areas of science, beginning with malaria and tuberculosis research, the biological control of rabbit populations, the elimination of smallpox and later in epidemiology, population dynamics and the environment. All the fields that Frank Fenner worked in are still actively researched today. The series will focus on the latest scientific advances being made in these fields.

- **1 February 2011** 'Frank Fenner tribute symposium'.
  Professor Peter Doherty AC FAA FRS Nobel Laureate
  – *Fenner the immunologist*
  Emeritus Professor Henry Nix AO
  – *Earth, air, fire, water, life*
  Professor Adrian Gibbs FAA
  – *Virology: carpe diem*
- **1 March** 'Bioterrorism: Who do we need to fear the most, the terrorist or the research scientist?' Professor Ian Ramshaw, Group leader of the Vaccine Immunology Laboratory, The John Curtin School of Medical Research

Transcripts of the tribute symposium and video recordings of this series are available from **science.org.au/events/publiclectures/fs/index.html**

Non-series lectures

- **27 April** Launch of *A big, bold, simple concept*. Book launch by architect Roger Pegrum with speakers including Professor Kurt Lambeck and the author and historian Dr Alan Roberts
- **23 September** 'Riding the X-ray wave: some personal reflections'. 2010 Lloyd Rees Lecture by Dr Stephen Wilkins, Chief Research Scientist, CSIRO. Held at CSIRO Clayton, Victoria
- **23 September** 'Discovery of *Australopithicus sediba* in South Africa: implications for our family tree' by Professor Paul Dirks, Head of School of Earth and Environmental Sciences, James Cook University
- **18 November** 'Cooperation for a green, smart and sustainable future in the changing world'. Public lecture by Professor Yongxiang Lu FAA, President of the Chinese Academy of Sciences
- **23 March** 'China's science and technology policy' by Dr Wan Gang, Minister for Science and Technology of the People's Republic of China

Publications

Publications produced by the Academy are generally available in hardcopy and online. A full listing is available in Appendix 16.

Mat Trinca and John Passioura present Luke Keogh (centre) with his certificate and prize

Historical Records of Australian Science

Historical Records of Australian Science is the journal of record for the history of science, both pure and applied, in Australia and the southwest Pacific. It is a key resource for anyone studying the history of science. The journal publishes high-quality articles and reviews, biographical memoirs of deceased Fellows of the Academy commissioned by the Council of the Academy, and an annual bibliography of the history of Australian science.

The journal has an editorial board which sets and maintains the editorial standards for the journal and advises Council on matters of policy. The chair of the editorial board is Dr John Passioura FAA, who takes primary responsibility for identifying suitable authors for the biographical memoirs of deceased Fellows of the Academy that are published in the journal.

The journal is currently co-edited by Professor Rod Home, who has been the editor since 1984, and Dr Libby Robin, who took on the joint role in early 2010. The book reviews editor is Dr Sara Maroske, also an ex officio member of the journal's editorial board.

Two issues were published in 2010 with six historical articles, seven biographical memoirs, two series of book reviews covering 18 books and the annual bibliography of the history of Australian science, compiled by Helen Cohn. CSIRO Publishing has published the journal on behalf of the Academy since 2002. The contract was renewed for a further three years in early 2011.

All issues of the journal, from its inception in 1966 as *Records of the Australian Academy of Science*, are available on CSIRO Publishing's website at **www.publish.csiro.au/?nid=108**

Biographical memoirs reproduced from the journal are also made available on the Academy website following publication at **science.org.au/fellows/deceased.html**.

National Museum Student Prize

The 2010 National Museum of Australia Student Prize for History of Australian Science or Environmental Science was awarded to Luke Keogh for his entry Duboisia pituri: *a natural history*. Luke was presented with his certificate and prize by John Passioura and Mathew Trinca, Assistant Director, Collections, Contents and Exhibitions of the National Museum during an event entitled *An evening of environmental history* held at the Australian National University. A full explanation of the award is available from the National Committee for History and Philosophy of Science report on page 34.

Exploration and Endeavour: The Royal Society of London and the South Seas

The Academy worked with the Royal Society of London and the National Museum of Australia to mount this exhibition as part of the worldwide celebration of the 350th anniversary of the Royal Society and recognised the key role science has played in Australia's history from early exploration through to the present day. The displays featured unique treasures from voyages of discovery to the South Seas in the late 18th and early 19th centuries. These included the regulator and chronometers used by Captain Cook and original manuscripts on key observations.

Australian journals of scientific research

The Academy of Science and CSIRO jointly publish 11 Australian journals of scientific research.

The current five year agreement ends in 2012. The journals and their editors-in-chief are:

- *Australian Journal of Botany* – Professor Bob Hill
- *Australian Journal of Chemistry* – Professor Curt Wentrup FAA
- *Australian Journal of Zoology* – Professor Mark Elgar
- *Australian Systematic Botany* – Dr Mike Bayly
- *Crop and Pasture Science* – Professor John Irwin
- *Functional Plant Biology* – Dr Rana Munns FAA
- *Invertebrate Systematics* – Professor Andy Austin
- *Marine and Freshwater Research* – Professor Andrew Boulton and Professor Keith Hunter
- *Reproduction, Fertility and Development* – Professor Tony Flint
- *Soil Research* (formerly *Australian Journal of Soil Research*) – Professor Bob Gilkes
- *Wildlife Research* – Professor Charles Krebs

The journals have an international readership with subscribers in around 100 countries and may be used for free by scientists in 71 developing nations around the world, through the United Nations' Research4Life program. Approximately 50 per cent of published papers originate outside Australia. Researchers from 89 countries submitted papers to the journals during 2010.

Editorial policy for the series is developed by a Board of Standards appointed jointly by CSIRO and the Academy with a chair from each organisation. Professor Pauline Ladiges FAA has been the Academy's chair since 2009. Details of these and other journals published by CSIRO are available from **www.publish.csiro.au/%20nid/50.htm?nid=17**

Communications and media

Media coverage of Academy activities

The Academy has effectively doubled the number of media releases and media coverage from the same period in the previous year. This reflects the Academy's increasing public profile, especially in the area of science policy and current scientific issues. This led to Council's decision to appoint a Communications and Outreach Director, Kylie Walker, who took up the appointment in February 2011.

Thirty-nine media releases were distributed using the Australian Associated Press web-based distribution service to a range of radio, print or TV journalists around Australia appropriate to each release. All media releases are also made available on the Academy's website and are sent, by request, directly to subscribers.

The Academy's media coverage included over 600 media clips in the period, and an increase in online coverage. This demonstrates that the Academy has successfully built strong ties with the media as a source of credible information on science policy, science education and on current science topics. Science at the Shine Dome attracted extensive media coverage in relation to new Fellows, award winners and the appointment of Academy President, Suzanne Cory. In particular, there was a great deal of interest in the Academy's 2010 Mawson Medal winner Professor Patrick De Deckker and his research on dust storms in Australia, and from regional and rural media in the work on fruit fly by Dr Marianne Frommer FAA. The launch of the *Climate change science: questions and answers* document and the Theo Murphy High Flyers Think Tank achieved excellent coverage across TV, radio, print and online media in August. The special public lecture by Professor Paul Dirks, held in conjunction with James Cook University on the discovery of a new human ancestor and first exhibition of the *Australopithecus sediba* cast, also attracted widespread interest from the media and attracted over 180 people to the Shine Dome.

The Academy has developed a strong working relationship with the Australian Science Media Centre, becoming a gold sponsor this year. The Academy contributes regularly to the new *Inspiring Australia* calendar of science events in Canberra and our activities and statements are featured regularly in Science Media's daily bulletin.

Director, Communication and Outreach – Kylie Walker

The Academy's public lecture series continued to generate public interest. Interest in Academy publications has increased, assisted by launches by prominent figures. Media releases are available from **science.org.au/news/media/**

Electronic communication

The quarterly Academy *Newsletter* was mailed to about 1,500 people, and 864 subscribers were notified by email when the electronic copy became available on the Academy website. *Nova: Science in the news* remains popular among education specialists and the media, with 1,046 subscribers receiving regular updates on new topics. *Primary Connections* has also widened its outreach with 1,532 subscribers who receive information about the availability of new units and training events. A total of 900 early and mid career researchers also receive notifications about Academy activities and other information that may help advance their careers.

A full year has passed since the new-look Academy website was launched in March 2010. User feedback indicates that the site is more visually appealing and accessible to use. Further development is underway to improve accessibility and navigation between sections. An RSS feed to allow subscription to regularly updated content is now a feature of the Academy website. A video and image gallery has also been created and is being used to profile *Interviews with Australian scientists* and the new Fellows seminar from the annual Science at the Shine Dome event. The video gallery will also serve as an archive of recordings from the 2011 public lecture series. Public lectures were web-streamed live from the Academy website for the first time on 1 February for the opening tribute symposium of the 2011 series *Fenner's science today and tomorrow*.

Up-to-date news and announcements are available from **science.org.au/news**

The image gallery is available from **science.org.au/news/imagegallery/**

The video gallery is available from **science.org.au/news/video/**

Activities of regional groups

REGIONAL GROUPS OF ACADEMY FELLOWS HOST LOCAL EVENTS, OFTEN WITH OTHER LEARNED ACADEMIES, TO PROMOTE PUBLIC AWARENESS OF THE ACADEMY. THESE LOCAL ACTIVITIES ALSO PROVIDE OPPORTUNITIES FOR FELLOWS TO MEET SOCIALLY.

Australian Capital Territory

Chair: Professor John White FAA

The ACT Fellows had the opportunity to attend 26 lectures and events during the year. The Academy 2011 lecture series provided a comprehensive look at Australian water resources, including urban water catchments and their use, and the Murray-Darling both from the point of view of conservation and environmental protection. The significant events of the Shine Dome 50 year celebrations and the Open Day as well as the contributions from the Academy of Technological Sciences and Engineering (ATSE), the Humanities and Social Sciences Academies added variety to the program as always. Professor Frank Fenner's death in November 2010 was remembered with a state memorial service at the Australian National University and honoured by the Academy with a tribute symposium and 2011 public lecture series being held in his name.

Professor Susanne von Caemmerer and Dr John Passioura are thanked for their organisation of the Canberra Fellows dining club for the combined academies dinner event.

New South Wales

Chair: Professor Ian Dawes FAA

The NSW group held three functions in 2010. As has been the recent custom these were held jointly with the NSW branch of ATSE. The main dinner held at Leighton Hall, University of New South Wales (UNSW) on 10 August was hosted by the Academy to honour Professor Aibing Yu as the 2010 Ian Wark medallist, and included the presentation of the medal as well as a very informative talk from Professor Yu on the fourth (particulate) state of matter.

The group also hosted, in conjunction with our local ATSE colleagues a very successful evening of *Scientists stories – the academies meet high school students*. This evening meeting attracted 145 registrants, including mainly students but also members of the academies, teachers and parents. Professor Hugh Durrant-Whyte, Professor David James, Professor Elaine Saddler and Professor Steve Simpson gave wonderfully inspiring and enthusiastic 15 minute presentations. The success of their efforts can be gauged by the fact that at the end of the formal session the students all made a bee-line for the speakers to ask questions rather than to the food and drinks. Our thanks go to the Faculty of Science, UNSW, who funded the meeting and provided excellent organisation of the evening. A similar evening is already being organised for late July 2011.

The final group function was the annual dinner organised by ATSE at their traditional location of the Vibe Hotel, North Sydney. The guest speaker

was Dr Steve Myers, Director of Accelerators and Technology, CERN. He gave a very stimulating and informative *Status report on the Large Hadron Collider*. The timing was perfect given the subsequent announcements from CERN of their progress with operation of the beams at Geneva.

Queensland

Chair: Professor Perry Bartlett FAA

Three outstanding scientists from Queensland were elected as Fellows of the Academy in 2010 – Professor Scott O'Neill, Professor Bob Pressey and Professor Peter Visscher.

The scientific contributions of two of our newly elected Fellows were showcased to the wider public and academic communities at a joint public forum, with the Queensland division of ATSE, at the Queensland Brain Institute on 18 November 2010. The speakers Dr Rowan Gilmore FTSE and Kathy Hirschfeld FTSE spoke on commercialisation of research and managing tank fires in oil refineries and new Academy Fellows Professor Scott O'Neill FAA and Professor Peter Visscher FAA discussed genetic variation in populations and the possible control of dengue fever. The talks were highly appreciated by the 70-strong audience and generated spirited discussions during the cocktail party that followed the presentations.

The Queensland regional group was greatly saddened by the passing of two of its members in 2010, Emeritus Professor Lawrence Ernest Lyons FAA and Emeritus Professor John Frederick Adrian Sprent CBE FAA, and pay tribute to their outstanding contributions to science and the Academy.

Victoria

Chair: Professor Tony Klein FAA

The annual new Fellows' and medallists' symposium was held on 3 June 2010, with seven speakers who gave a varied and fascinating range of brief talks. The first speaker was Professor David Vaux of La Trobe University, the winner of the 2009 Macfarlane Burnet Medal, which recognises scientific research of the highest standing in the biological sciences. His topic was *A short history of cell death*, a subject to which he has made significant contributions. He was followed by Dr Amanda Barnard of the CSIRO Materials Science and Engineering Division, winner of the 2010 Frederick White Prize for research in the physical sciences, on *Thermodynamic cartography*. Next up was Professor Warwick Couch of Swinburne University, elected as an Academy Fellow in 2009, who talked about *Nature versus nurture on a cosmic scale*. The next few speakers were all recently elected Fellows of the Academy, firstly Professor Trevor Lithgow of Monash University on the subject of *The evolution of protein transportation machines in mitochondria*, then Professor Michael Parker of the St Vincent's Institute, who spoke about *A tale of two toxins*. The last two speakers, both recently elected Fellows and both from the School of Physics of the University of Melbourne, were Professor Ray Volkas who talked about *Neutrinos and new laws of physics* and Professor Steven Prawer whose title was *Diamond is a physicist's best friend*. The symposium was followed by a cocktail party and dinner for the speakers, Victorian Fellows, their partners and guests.

The joint academies' dinner, also an annual event, organised this year by our Academy, was held on 26 August with after-dinner speaker Professor Roger Short FAA FRS whose witty address about our over-populated globe was entitled *A plague of people*. This function was attended by all four presidents of the learned academies: Professor Suzanne Cory (AAS), Professor Robyn Batterham (ATSE), Professor Barry Macgaw (Academy of Social Sciences in Australia) and Professor Joseph LoBianco (Australian Academy of the Humanities), and all of them coincidentally, from the University of Melbourne.

A distinguished expert in X-ray science, Dr Steve Wilkins, a Chief Research Scientist in CSIRO, gave the 10th biennial Lloyd Rees lecture on 23 September. His title was *Riding the X-ray wave – some personal reflections*. The event, organised by Professor Peter Hannaford FAA, attracted a very good audience, which included quite a few of the late Lloyd Rees' former colleagues.

The traditional Christmas party and dinner was held on 25 November at a new venue – The Boulevard Restaurant in Yarra Bend Park. Our President, Professor Suzanne Cory, and her husband Professor Jerry Adams were in attendance, as was past president Professor Sir Gustav Nossal and Lyn Nossal, along with a pleasingly large number of Fellows and their guests, including the Chief Executive, Dr Sue Meek. A fairly authentic mariachi band provided an excellent and very well appreciated musical interlude.

The Shine Dome and Ian Potter House

THE MODERNIST COPPER DOME OF THE ACADEMY'S SHINE DOME IS A RARE EXAMPLE OF A 20TH CENTURY FREESTANDING DOME AND REPRESENTS AN ARCHITECTURAL LANDMARK AND CONSTRUCTION MILESTONE IN AUSTRALIA DUE TO ITS INNOVATIVE STRUCTURE, COMPLEMENTARY INTERIOR AND SURROUNDING CIRCULAR MOAT. THE DOME WAS THE FIRST CANBERRA BUILDING TO BE INCLUDED ON THE NATIONAL HERITAGE LIST, IN SEPTEMBER 2005. THE ACADEMY SECRETARIAT IS LOCATED IN THE ADJACENT IAN POTTER HOUSE. BOTH BUILDINGS AND THEIR SURROUNDS ARE REGISTERED AS PART OF THE NATIONAL ESTATE.

Key Academy events held at the Dome are discussed in the Public Awareness and Outreach section of this report (page 58).

Other events held at the Dome

A variety of Academy and non-Academy functions and events were held at the Shine Dome throughout the year. Australian Institute of Aboriginal and Torres Strait Islander Studies held a three-day conference on *IT and Indigenous communities*, the Australian National University held its annual two-day Fenner Conference and the Australian Science Festival hosted a number of activities at the Shine Dome as part of their annual event. We were also involved in organising the Australian Mammal Society's annual conference, which was the longest running event to be held at the Shine Dome this year (five full consecutive days). The Academy of the Social Sciences in Australia, and the Meat and Livestock Forum returned with their annual forums and symposiums. Other major events held during the year included the International Symposium on Analysis and Detection of Explosives, the Boden Research Conference, the Australian Society of Aerospace Medicine Conference and the ARC Centre of Excellence for Coral Reef Studies Symposium. The National Health and Medical Research Council held their dinner combined with their Excellence Awards in December and were so pleased with the Shine Dome that they plan to use it again for their 2011 event.

Events held at the Shine Dome during the reporting period are listed in Appendix 17.

Dome maintenance and upgrades

The Shine Dome is maintained and conserved following National Heritage guidelines.

A set of 40 heritage chairs have been restored. The chairs were made in Denmark and are part of the original Dome furniture. Some seating within the Ian Wark Theatre was also refurbished and plaques were fitted in recognition of two donations

Ian Potter House during the refurbishment process

of more than $500 for the upkeep of the Academy buildings. A second set of archive compactuses was also installed in the Dome basement during the reporting period.

Video conferencing was set up in early 2010 and upgraded during the year. Secretariat staff received training on its set-up and use. A hearing loop installed six years ago in the Ian Wark Theatre has been replaced and fine tuned.

Ian Potter House

The ground floor of Ian Potter House refurbishment process commenced in May 2010 and took two months to complete. Work was carried out on the floor to reduce noise and movement and the existing carpet was replaced. Modern production techniques meant that it was cost competitive with commercially available standard stock to have new carpet custom-made in Germany. Its striking design was inspired by the shape of the Dome and the Academy's corporate colours – gold and blue.

The kitchen was also enlarged and renovated. A new fanned snorkel vent damp reduction system was designed and installed for the building, ventilation was installed in the bathrooms and copy room, and a purpose built, separately air conditioned room was built around the server which was completely replaced in December.

Two compactus units were also installed to create additional administrative storage.

The Australian Primary Health Care Research Institute from the Australian National University, leased the Edinburgh Avenue wing of the first floor of Ian Potter House in mid July for a three year term. The tenants have since accepted the Academy's offer to expand their lease to include the central area incorporating the upstairs meeting room. The relocation of *Primary Connections* education staff to Bondi Junction in Sydney has enabled Science Policy to move into this space upstairs allowing co-location of communications and publications staff downstairs.

New signage has been designed and installed within the grounds to enhance the Academy's presence and clarify the association between Ian Potter House and the Dome.

The Academy applied for two grants from the National Historic Sites program: the first for refurbishing the roof of Ian Potter House which was unsuccessful and the second to provide extra lighting to the Dome which we are happy to report was successful and will be in place soon. An automatic drainage system has also been installed in the basement of the Dome to guard against possible flooding.

Support for Academy activities

FUNDS WERE RECEIVED FROM VARIOUS SOURCES DURING THE REPORTING PERIOD TO SUPPORT ACADEMY ACTIVITIES. THESE GRANTS AND DONATIONS ASSIST THE ACADEMY TO PROMOTE EXCELLENCE IN AUSTRALIAN SCIENCE WITHIN AND BEYOND THE FELLOWSHIP AND AUSTRALIA.

The Academy acknowledges the sponsorships, donations and grants received throughout the year with gratitude. Funds received above $1,000 are listed in Appendix 18.

Basser Library

THE LIBRARY WAS ESTABLISHED IN 1960 WITH A GIFT OF £25,000 FROM THE PHILANTHROPIST SIR ADOLPH BASSER (1887–1964), AFTER WHOM IT IS NAMED. BOTH PUBLISHED AND UNPUBLISHED MATERIAL, DOCUMENTING THE HISTORY OF SCIENCE IN AUSTRALIA, IS COLLECTED AND RELATED HISTORICAL RESEARCH IS WELCOMED.

Manuscript collection

The manuscript collection contains 227 collections of papers, including material from both individual scientists and scientific societies. Prominent Australian scientists represented in the collection include academics such as Professor Frank Fenner AC FAA FRS and Sir Ernest Titterton FAA, significant figures in CSIRO such as Sir David Rivett FAA FRS, Sir Ian Wark FAA FTSE and Dr Lloyd Rees FAA, and more than 60 other Fellows of the Academy. The largest collections from scientific societies are those from the Australian Institute of Physics and the Geological Society of Australia.

Academy librarian Rosanne Walker

Over the past year extra material was added to the records of the Australian Mammal Society, Australian Mathematical Society, Australian Society for Parasitology, JT Clifford, Geological Society of Australia and JE Moyal. Material was also received for two new collections – Professor Athel Beckwith FAA FRACI FRS and Dr Alan Head AO FAA FRS. Listings of the library's manuscript collections are available from the Academy website **science.org.au/basser/mslist.html**

Books and journals

Most of the monograph backlog has now been catalogued. These books are now available through the National Library's Trove website, which invites people to 'explore Australian collections and worldwide online sources', at **http://trove.nla.gov.au/**

Staffing and use

The library is currently staffed four days a week by a qualified librarian with training in archives work. The library receives a range of visitors with simple requests for copies of articles to scholars, historians and filmmakers requiring longer research visits. Our biographical resources, in particular the biographies of Australian botanists compiled for the Hunt Institute, are regularly used, particularly by family historians.

Researchers from almost every state and territory in Australia, as well as the USA have visited the library to use the collections during the past year. Electronic requests to access the collection have also come from overseas, particularly New Zealand and the USA.

Obituaries

Athelstan Laurence Johnson Beckwith

PHOTO: ANU PHOTOGRAPHY

Elected to Fellowship 1973

Athel Beckwith was born in Perth, Western Australia, on 20 February 1930 to Laurence Alfred Beckwith, a pharmacist, and Doris Grace née Johnson. He commenced primary school in Perth, but wartime precautionary measures saw the adult females of the Beckwith family together with Athel and his two brothers moved to Porongurup, some 400 km to the south, with the boys attending school at Mt Barker. Athel completed his schooling at Perth Modern School and enrolled at the University of Western Australia (UWA), completing a BSc with first class honours in chemistry in 1951.

Pausing before proceeding to a research higher degree, Beckwith spent two years as a graduate assistant at UWA. In January 1953 he married Phyllis Kaye Marshall and soon after the couple moved to Adelaide where Athel had accepted a junior lectureship at the university. They were to have three children, Paul, Catherine and Claire, all of whom, together with Kaye, survive him.

Athel's research career developed in Adelaide to the point where, after two years, he applied for and was awarded a CSIRO overseas scholarship which enabled him to follow a growing interest in free radical chemistry by working at the University of Oxford with world-leader William Waters. In September 1956 Athel's thesis *Free radical reactions of higher aromatic hydrocarbons* earned him his DPhil degree which was conferred the next month. The stay in England was prolonged because of shipping delays caused by the Suez conflict, but during the interregnum CSIRO supported his continued research with colleagues at Oxford and London. Finally arriving in Melbourne in early 1957, he was assigned to work with Harold Hatt, seeking chemical ways to utilise the waxes and steroids of lanoline.

In 1958 he returned to academe at the University of Adelaide where he was successively lecturer (1958–61), senior lecturer (1962–63) and reader (1964) in organic chemistry before being appointed to the chair in 1965, succeeding Geoffrey Badger in that position. His career flourished, as the 1960s and 1970s saw luxuriant growth in the field of organic chemistry where there was increased funding, a flow of talented graduate students, and important problems of structural and mechanistic chemistry to be attacked and solved. In 1973 Athel was elected to the Fellowship of the Australian Academy of Science. He was active in the Royal Australian Chemical Institute, first at state (South Australia) and later at national level. His research earned him the institute's early career Rennie Medal in 1959 and the HG Smith Award in 1980.

In 1981 Athel was appointed professor in the Research School of Chemistry, successor to Arthur Birch, at the Australian National University (ANU). This meant a major relocation for the research group, to a situation where resources, both equipment and technical assistance, were more abundant and undergraduate teaching was not required. Kaye had to leave behind a career in public service which had developed in Adelaide, in Aboriginal affairs then in local government as an elected councillor and alderman, and in the conservation movement. In Canberra she found the time to follow her interest in Indigenous culture as a collector and dealer in Aboriginal art.

In Canberra, Athel became more involved in the work of the Academy, being a member of Council in 1983–86, including vice-presidency in 1985–86, and again from 1997–2001 when he was treasurer. He was also active in the Royal Australian Chemical Institute, being vice-president in 1983–84 and president 1984–85, and receiving the Institute's Organic Chemistry Medal in 1992 and its highest award, the Leighton Medal, in 1997. The UK-based Royal Society of Chemistry awarded him a Centenary Medal in 1993 and in 2003 he received a Centenary of Federation Medal in Australia. Greater recognition of his achievements, however, came in his election to the fellowship of the Royal Society of London in 1989.

The molecules that make up the lexicon of organic chemistry consist of atoms linked together in various ways by pairs of electrons. In contrast, free radicals are species with unpaired electrons. They play important parts in many molecular transformations and reactions, being mostly short-lived and highly reactive, hence their designation as reactive intermediates. Beckwith entered the field as the nature of radicals was becoming better understood in the 1950s, and their – hitherto often unsuspected – roles in chemical reactions were being revealed. Beckwith was a leader among chemists who learned to generate free radicals at sites where intra and intermolecular reactions could take place, and to study reaction rates and stereochemical outcomes. His and his students' work at the laboratory bench was aided by spectroscopy, in particular electron spin resonance, and by calculations performed within his research group and in collaboration with theoretical chemists. In his field of specialisation he was a consultant to CSIRO and industry. Many academic researchers – I was one – also sought his advice on free radical chemistry.

Athel's reputation as a fine lecturer, which began in Perth, when coupled with his research achievements made him a popular speaker at national and international conferences, notably the Gordon conferences and the Burgenstock meetings. Despite the crippling effects of childhood osteomyelitis, which he bore throughout his life, Athel adored the stimulation of travel and shared this with his family during several periods abroad on study leave. These included time back in the UK at Imperial College, University of York and Oxford. There were in addition many side trips to continental Europe, a three-month lecture tour of the US as a Carnegie Fellow, and a senior von Humboldt award that supported periods of research in Freiburg, Germany.

As an administrator and academic leader, Athel was very much a man of his times, encouraging consultative decision-making and breaking down barriers of formality wherever he encountered them in organisations to which he belonged. At ANU he saw his special responsibility as maintaining the status of what is doubtless the leading school of organic chemistry in Australia, a major contribution to which was the appointment of young chemists who had proved themselves in Australia and at international level and who had much to give the institution as their careers developed further.

His academic 'children and grandchildren' paid him the compliment of a symposium of research results and reminiscences on his 80th birthday. His influence on day-to-day chemistry in Australia is perpetuated by the Centre of Excellence for Free Radical Chemistry. This dispersed organisation based in several Australian universities includes several Beckwith graduates – one of whom is the Centre Director, Professor Carl Schiesser of the University of Melbourne, and another, Chris Easton, a professor in the Research School of Chemistry at the ANU.

Like both of his parents, Athel was a more than competent musician, taking lessons in classical piano from age six, and in his mid teens turning to the clarinet as his love of jazz developed. One of the nicest tributes on his death came from the Canberra Jazz Club, who remembered him as 'the chemistry professor who took on free radicals – and won'. Athel was killed in a car accident in 2010. Kaye was seriously injured but made a full recovery.

Ian D Rae

Louis Charles Birch

Elected to Fellowship 1961

Louis Charles Birch was born in Melbourne on 8 February 1918, and died in Sydney on 19 December 2009. Charles, as he was always known, was educated at Scotch College, Melbourne, and at the University of Melbourne obtaining a BAgrSc in 1939. After graduating he moved to Adelaide to work as a research entomologist under the supervision of Herbert G Andrewartha at the Waite Agricultural Research Institute. He obtained an MSc from the University of Adelaide in 1941, and was later awarded a DSc in 1948.

Food security and production during the war years was a national service focus for agricultural scientists, and so Charles first worked on the problem of the plague grasshopper in the South Australian wheat belt, and then investigated insect pests in silos, such as the wheat weevil. It was known that weevils flourished in the outer layers of large mounds of grain, and finding that deep within the mound the temperature was higher and the relative humidity and moisture content was lower than that in the surface layers, Charles concluded it was simply too hot and dry for weevils to live any deeper than about 12 inches from the surface. Results of Charles's work were soon applied to prevent the deterioration in the quality of stored wheat resulting in millions of bushels being stored without infestation.

It was also during these war years in Adelaide that, together, Andrewartha and Birch made significant contributions to the study of population ecology. Until then the dominant view was that animal populations were controlled primarily through the competition for resources. They demonstrated that external forces and disturbances such as weather were very important as well for the control of population numbers and their distributions.

Their work was published as *The distribution and abundance of animals* by the University of Chicago Press in 1954, and soon became a most influential and enduring text in ecological studies. It is a classic volume for biologists everywhere. They were jointly awarded the David Syme Research Prize in 1954. Thirty years later they collaborated again to publish *The ecological web: more on the distribution and abundance of animals* (University of Chicago Press, 1984).

In Adelaide, too, Charles developed a particular world view that remained a strong constant for the rest of his life. Having been brought up in a strong religious environment in Melbourne he found that his basic beliefs were being rigorously challenged by the people he worked with at the Waite. But he also joined the Australian student Christian movement at the University of Adelaide – a more liberal-minded and ecumenical student group – and his thinking began to broaden and to change. He started to read more philosophy – particularly the works of Plato and of the contemporary Anglo-American philosopher, Alfred North Whitehead. He became very interested in the relation of science, religion and ethics, and the social responsibility of scientists.

In 1946 he went to the University of Chicago on a senior scholarship under the Commonwealth science and industry endowment fund to continue the research in insect ecology. The following year he studied animal population dynamics with Charles Elton at the University of Oxford. Returning from Britain in 1948, Charles joined the University of Sydney as a senior lecturer in zoology.

He began research on the Queensland fruit fly, finding that populations spreading south evolved in response to a changed environment. He then started investigating the important relationship between evolution and ecology – work he further pursued in Brazil with Theodosius Dobzhansky in 1955.

In 1954 he was the first to introduce the teaching of animal ecology in Australia. He was promoted to a readership in zoology from 1954 to 1960 when he became the Challis Professor of Biology holding

the chair until his retirement in 1984. He then took the title of professor emeritus. He was a Fulbright scholar at Columbia University in 1954, and in 1955 was visiting professor of biology at the University of Sao Paulo in Brazil. He was visiting professor of zoology at the University of Minnesota in 1957 and visiting professor of genetics at the University of California, Berkeley, in 1960.

A major administrative project for him at the University of Sydney was to combine the departments of zoology (founded in 1880) and botany (founded in 1913) to form the larger School of Biological Sciences in 1962. He was also instrumental in establishing the history and philosophy of science unit within the science faculty, and the Centre for Human Aspects of Science and Technology. He had a long connection with Wesley College at the University of Sydney and for several years was the vice-master. In 2000 he was awarded a DSc *honoris causa*.

In 1965 he published *Nature and God* – a short but very popular work on the history of the conflict between science and religion. It brought him fame beyond purely academic circles. He was involved for quite a number of years with the Wayside Chapel in Kings Cross and was publicly opposed to the Vietnam War, setting up the Committee for Conscience to assist students who were arrested for avoiding the draft. He promoted the 'zero population growth movement' in Australia and became a member of the Club of Rome.

Margaret Mead invited Charles to be part of a program on science, technology and the future, which she was setting up with the World Council of Churches. He played a leading role for them for some 20 years, 13 of which he was the vice-moderator. Most importantly in a major speech at the Council's Nairobi Assembly in 1975, he introduced the concept of the ecologically sustainable society. From that point on, sustainability quickly became part of the everyday vocabulary and discussion. He was awarded the Templeton Prize for progress in religion in 1990.

Charles was elected to the Australian Academy of Science in 1961, and served on the Academy Council from 1965 to 1967. In 1988 he won the Gold Medal of the Ecological Society of Australia, as well as the Ecological Society of America Eminent Ecologist Award. The Ecological Society of America later honoured him with an honorary life fellowship, as did the British Ecological Society and the Academy of Environmental Biology, India. In 2008 he was made a Member in the General Division of the Order of Australia.

Other publications include *Confronting the future: Australia and the world – the next 100 years* (1975, 1993), *The liberation of life: from cell to community* (1981), *On purpose* (1990), *Regaining compassion for humanity and nature* (1993), *Feelings* (1995) and *Science and soul* (2007).

Charles never married and is survived by his twin brother Sid, sister-in-law Jenny, and their family. His older brother Hugh died in 1996.

Peter Farleigh

Keith David Cole

Elected to Fellowship 1983

Keith Cole passed away in Melbourne, Australia, on 13 December 2010. He was born in Cairns in Queensland on 2 March 1929 and grew up there. He received BSc (Hons) (1952); DipEd (1953); MSc (1954) and DSc (1967) from the University of Queensland. After a short time as a secondary school teacher, Keith was appointed auroral physicist on the Australian National Antarctic Research Expedition to Macquarie Island in 1956, and so began his lifelong research into the aurora and other solar-terrestrial phenomena. After the year-long expedition he took up a position as a theoretical physicist with the Australian Antarctic Division (AAD) where he remained until 1962 when he was seconded to the CSIRO upper atmosphere section, headed by David Martyn.

After periods at the University of Chicago and University of Colorado as a research associate, in

1966 Keith took up his appointment as a foundation professor of physics at La Trobe University in Melbourne. By this time he had established himself as a leading theorist in solar-terrestrial physics having shown that red arcs and the pre-dawn enhancement are produced by thermal conduction from above, and having made significant advances in our understanding of geomagnetic storms and particularly the ring current. In 1962 he proposed that the ionosphere is heated via Joule heating, a phenomenon now known to be a major energy source for the ionosphere and thermosphere at high latitudes.

Keith formed the theoretical and space physics group at La Trobe which he headed until his retirement. Under Keith's leadership the group built the Beveridge field station north of Melbourne and developed radio, optical and magnetic instruments for use at Beveridge and at Australian Antarctic stations. These instruments were used to study a wide range of phenomena in the ionosphere, thermosphere and magnetosphere. Keith also continued his theoretical research into geomagnetic storms, ionospheric irregularities and other phenomena in the magnetosphere-ionosphere system.

Keith did not confine himself to his own research interests and those of his many postgraduate students. He also made major contributions to the organisation of science both nationally and internationally. He served the International Association of Geomagnetism and Aeronomy (IAGA) as vice-president (1976–79) and president (1980–83) and was president of the Scientific Committee on Solar-terrestrial Physics (SCOSTEP) (1977–86). In these roles he was a vigorous promoter of international scientific programs, so essential for the study of global scale phenomena.

At La Trobe Keith served terms as head of physics and dean of the school of physical sciences. Nationally, he was a very active Fellow of the Academy, serving as foreign secretary, Council member and chair of various committees including the National Committee for Solar-Terrestrial Physics. These roles also provided avenues to promote participation by Australian scientists in international programs including the important ICSU International Geosphere-Biosphere Program.

Keith was an outstanding colleague and mentor for many people around the world. He was a person of ideas and was popular as an invited speaker as he would provide a fresh view on topics and challenge people with new ideas.

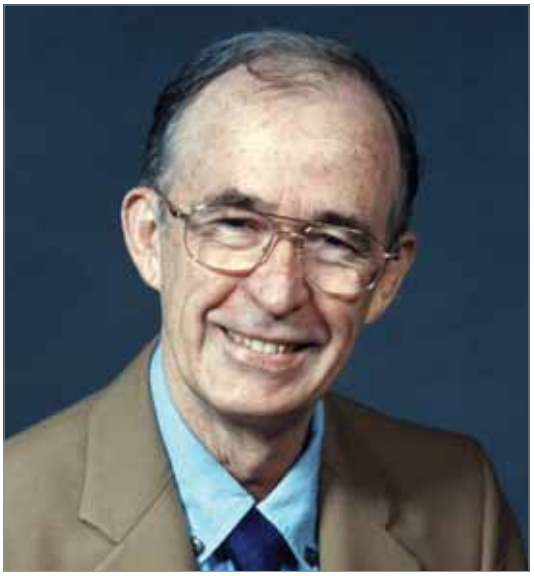
He received many honours recognising his contributions to science, including the International Union of Radio Science (URSI) Appleton Prize for contributions to the understanding of the basic processes taking place in the magnetosphere and the ionosphere, life membership of the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP), honorary membership of IAGA, fellowships of the Australian Academy of Science, the Australian Institute of Physics, the Institute of Physics (UK), the Indian Institute of Geomagnetism, the Explorers Club of New York, and associate of the Royal Astronomical Society, London.

Keith's scientific legacy will live on through his contributions to the basic science of solar-terrestrial physics phenomena and through the many colleagues and students he influenced throughout his career.

Keith married Ailsa Moore in 1956. The marriage ended in divorce in 1981. In 1989 he married Valery Troitskaya (died 2010) who had also been president of IAGA. They settled in Melbourne near La Trobe University where Keith was professor of physics. Keith is survived by his son David.

Peter Dyson

Rossiter Henry (Ross) Crozier



Elected to Fellowship 2003

Ross Crozier was born on 4 January 1943 in Jodhpur, India, the son of Sheila Sybil Goss and Laurence Arlington Crozier, and died on

12 November 2009 in Townsville. On 2 March 1968 he married Yuen Ching Kok and is survived by his wife Ching and sons Michael and Ken.

Ross Crozier was educated at Geelong Grammar School and received both BSc (1965) and MSc (1966) degrees from the University of Melbourne. He studied for his PhD at Cornell University under the supervision of William Brown, entomologist and ant specialist, graduating in 1969.

Crozier held the following academic posts: professor, School of Tropical Biology, James Cook University (2000–09); professor, Department of Genetics and Human Variation, La Trobe University (1990–2000); professor (personal chair) (1989–90), associate professor (1982–90), senior lecturer (1977–81), lecturer, (1975–76) all at the University of New South Wales; assistant professor, Department of Entomology, University of Georgia (1970–74).

He served on numerous editorial boards including *Molecular Biology and Evolution*, *Genetique*, *Selection*, *Evolution*, *Annual Review of Ecology and Systematics*, *Journal of Molecular Evolution*, *Australian Biologist* and *Insectes Sociaux*. He served as associate editor for the journals *Evolution*, *Behavioral Ecology and Sociobiology*, *Molecular Biology and Evolution* and *Ecology Letters*.

He served on the Australian Research Council (ARC) biology panel 1993–95, chairing an ARC committee on access to Australia's genetic resources. From 1995–2002 he served on the board of the Australian Genome Information Centre as ARC representative. He was a member of the scientific advisory committee to the Zoological Parks and Gardens Board of Victoria. He held two successive special investigator awards from the ARC.

Crozier authored two books, *Animal cytogenetics 3 Insecta* (1975) and *Evolution of social insect colonies: sex allocation and kin selection* (1996), and published over 200 papers which were collectively cited more than 5,000 times at the time of his death.

Crozier was elected Fellow of the Academy in 2003, serving on the Council from 2007 until his death. He was also a Fellow of the American Association for the Advancement of Science since 2002. In 2006 he was awarded the inaugural Hamilton Award by the International Union for the Study of Social Insects for 'lifetime achievement in the biology of social insects'.

Crozier made outstanding contributions to phylogenetic inference, cytogenetics, population genetics, sociobiology and conservation genetics. Crozier's overriding interest, applied in all these areas of biology, was the evolution and diversity of social insects, particularly ants.

In early years he used cytogenetic techniques to investigate diversity (in its broadest sense) of Australian and American ants. He published a widely adopted protocol for preparing ant chromosomes for study. Modifications of this protocol are used to this day for a variety of insects. One of Crozier's more curious cytogenetic discoveries was an ant species with only one chromosome.

He was one of the first to appreciate the significance of William Hamilton's ideas about inclusive fitness and the importance of genetic relatedness to the evolution of sociality in insects. He was the first to use allozyme data for estimating the relatedness of individuals within and between colonies. This required development of new statistical procedures that are still used.

Multiple mating by social insect queens is unexpected because it lowers intra-colonial relatedness, and yet multiple mating is widespread, especially in the advanced bees and ants. In 1985 (with Robert Page) Crozier evaluated 13 hypotheses for their ability to explain the evolution of multiple mating. This paper had an extraordinary impact. Crozier's front running hypotheses have been tested in dozens of species by dozens of labs. He also formalised the theory of kin recognition, the idea that if an individual is to direct care towards a relative, it would need to be able to recognise it first. Crozier explored the possibility that genetic cues are used as a basis for kin recognition, leading to what has become known as Crozier's paradox. Imagine a species that relies on genetically based cues to distinguish kin from non-kin. The more two individuals differ at the recognition loci the less likely they are to recognise each other as being related. Such a system will work better if there is great alleleic diversity, for when there is limited genetic variance, the chance of costly mistakes rises. However, a bearer of a new allele in the population is likely to bear the brunt of antagonism from kin and non-kin alike, reducing the chance of the new allele spreading, and the workability of a genetic basis to kin recognition system.

Crozier's group later pioneered the application of microsatellites (a kind of molecular genetic marker) for pedigree reconstruction in honeybee colonies.

This work revealed unexpected reproduction by workers, and sparked a new field searching for reproductive cheats in insect colonies and in other group-living animals.

In 1993 Ross and Ching published the complete sequence of the honeybee mitochondria. This was only the second complete sequence to be obtained from an insect after Drosophila. Crozier found numerous changes in gene order between bee and fly, which remain unexplained, and a remarkably high AT content in the honeybee DNA sequence.

Phylogeny reconstruction techniques of the day assumed that mutations are random across the lineages being studied. Crozier's insight, based on the comparison of the bee mitochondria with that of a fly, was to show that directional mutation pressure towards A and T in certain lineages can lead to significant errors in phylogeny reconstruction. He pioneered the application of maximum likelihood consensus trees to phylogeny reconstruction, for this is the only technique that can take account of directional mutation pressure.

Crozier's expertise in phylogeny reconstruction led to an interest in setting conservation priorities – how best to spend scarce conservation dollars to maximise biodiversity. Crozier pointed out that a species that is phylogenetically novel, like a tuatara, should perhaps be more valued than a species like *Drosophila simulans*, which has numerous sister taxa. This view is controversial, but we think it is a sensible one.

Ross Crozier was an extraordinary mentor of students and postdoctoral researchers, whose influence now spans the globe. During his career he supervised 33 honours students, 26 postgraduate students and 18 postdoctoral fellows.

Ben Oldroyd
Oliver Mayo

Hans Charles Freeman

Elected to Fellowship 1984

Hans Charles Freeman was a true pioneer and gained national and international recognition in a range of research areas, as well as being an inspirational teacher, and ceaseless campaigner for science in Australia.

Hans was born in Breslau, Germany on 26 May 1929 and moved to Australia at age nine with his father Karl, mother Lotte, and sister Eva, after Karl received

a tip-off from a member of the Nazi Party on the impending persecution of Jews. Hans quickly adapted to his new life and the following year was dux of Double Bay Public School. He was then dux of Sydney Boys High before commencing his studies at the University of Sydney where he graduated with a BSc (Hons) first class, and the University Medal in Chemistry (1949), then completed an MSc (1952), both under the supervision of Professor Raymond Le Fèvre FRS. He subsequently spent a year at the California Institute of Technology as a Rotary Foundation Fellow under the supervision of Dr Edward W Hughes after Nobel Laureate, Linus Pauling, sparked his enthusiasm for crystallography. Hans returned to the University of Sydney to complete a PhD in 1957 and held academic positions at the University of Sydney from 1950 until he passed away. These included: teaching fellow (1950–51); temporary lecturer (1952); lecturer (1954–57); senior lecturer (1959–64); reader (1964–71); foundation professor of inorganic chemistry (1971–95); head, School of Chemistry (1975–76); professor of chemistry (1995–97); professor emeritus (chemistry and molecular and microbial biosciences) (1998–2008).

Hans held the following visiting appointments: George Ellery Hale research fellow, California Institute of Technology (1958–59); visiting lecturer, inorganic chemistry, University of Basel (1966); visiting professor, biochemistry, University of Göteborg (1966); visiting professor, molecular biophysics, Yale University (1968); guest professor, inorganic chemistry, University of Copenhagen (1977); and visiting scholar, Chemistry and Stanford Synchrotron Radiation Laboratory, Stanford University (1983). He was elected as a Fellow of the Royal Australian Chemical Institute (RACI) in 1968;

the Royal Society of Chemistry in 1984 and the Australian Academy of Science in 1984 and was honoured with the award of Member of the Order of Australia in 2005 for his contributions to science, particularly inorganic chemistry. He also received the Australian Academy of Science Craig Medal for Chemistry (2007); the Royal Society of New South Wales' Liversidge lecturer (1979); the Inorganic Chemistry Award and Burrows Medal (1980); the Leighton Medal (1999), and distinguished fellowship of RACI.

Hans was active in the Academy and served as chair of its National Committee for Crystallography from 1984–93 during which time he headed an inquiry on access to 'big science' facilities (1988–89). This led on to his involvement as a committee member on the Australian Department of Industry, Technology and Commerce, International Science and Technology advisory committee (1989–92); the Australian Science and Technology Council working party on Australian participation in major accelerator and beam facilities, *Small country, big science* (1989–90); and Australian Science and Technology Council working party on major national research facilities *Major research facilities – a national program* (1991–92). As such, he was instrumental in establishing the Access to major facilities program, the Australian Synchrotron research program and, ultimately, provided the basis for the development of the Australian Synchrotron.

Hans made other major contributions to the development of a vibrant and internationally recognised community in crystallography and synchrotron science. As the foundation president of the Society of Crystallographers in Australia (1976–77) and his memberships of the Australian National Beamline Facility (Management and Program Committees, 1991–95); Australian Synchrotron Research program (Policy and Review Board, 1996–2008); and Advanced Photon Source, Argonne, USA (Consortium for Advanced Radiation Sources, Board of Governors, 1998 until 2008), he was pivotal in paving the way for groundbreaking research in these areas.

Other noteworthy contributions included being the chair of the Coordination and Metal Organic Chemistry division of RACI (1971–73), a member of the international program committee for the 13th (1984) and 15th (1990) International Congresses of Crystallography and chair of the program committee for the highly successful 14th Congress held in Perth in 1987.

With Alex Boden FAA he founded the Foundation for Inorganic Chemistry at the University of Sydney in 1972. This foundation continues to bring high profile international researchers to Australia and has been instrumental in providing many opportunities for international collaborations and for students and other researchers to join prominent overseas research groups. The first of these visitors was Nobel Prize winner, Linus Pauling, whose visit led directly to the establishment of the Human Nutrition Department at the University of Sydney.

For over 40 years, Hans was one of Australia's most highly regarded chemists, both locally and internationally. He was a pioneer in the development of crystallography in Australia, and was responsible for the construction of Australia's first diffractometer and the purchase of the first 4-circle diffractometer. He pioneered the use of computers in crystal structure analysis, including using Australia's second computer, SILLIAC. His leadership resulted in Australian crystallography making an impact far beyond what might otherwise be expected.

Soon after becoming chair of inorganic chemistry, Hans established the first protein crystallography laboratory in Australia and together with important contributions from Peter Colman – later, a Fellow of the Academy – and Mitchell Guss amongst others, Australia's first protein crystal structures were determined. Professor Guss became a long-time collaborator and subsequently headed the protein crystallography laboratory in the School of Molecular Bioscience within the University of Sydney, where Hans upon retirement continued his interest in protein crystallography until his death.

Hans's initial interests focused on the successful determination of the structure of the electron transfer protein, plastocyanin, which had a dramatic effect on the field of bioinorganic chemistry. This achievement was celebrated on its 25th anniversary in a special session at the 11th International Conference on Biological Inorganic Chemistry. Hans made many other important contributions to crystallography (protein and metal complexes) and active-site determinations of metalloproteins by X-ray absorption spectroscopy.

Hans died on 9 November 2008. He is survived by his wife, Edith, his children, Maeva and Philip, and sister, Eva.

Peter Lay

Anton Linder Hales

Elected to Fellowship 1976

Anton Linder Hales was a geophysicist whose career spanned three continents – South Africa, North America and Australia. His connections with Australia went back to the 1950s but his most important period occurred from 1973 to 1978 when he was the first director of the Research School of Earth Sciences (RSES) at the ANU. He came as a widely respected scientist and with very considerable experience in the administration of universities and research laboratories, having previously led similar institutions in South Africa and in Dallas, Texas. This experience, together with his broad research experience in Earth sciences and worldwide contacts, made him an ideal founding director of RSES. During this period RSES became one of the leading geoscience institutions in the world.

Professor Hales was born on 1 March 1911 in Mossel Bay, Cape Province, South Africa. He showed an early brilliance for science, entering the University of Cape Town and studying physics and mathematics. He graduated with a BSc degree, awarded with distinction, at age 18, and received an MSc degree the following year. At age 20 he was appointed a junior lecturer in applied mathematics at the University of the Witwatersrand in Johannesburg. The following year he went to the University of Cambridge, where he studied with the famous mathematician and geophysicist Harold Jeffreys. This influence can be seen in the geophysical pursuits he followed for the rest of his life.

He finished the maths tripos at Cambridge in 1933, and returned to the Applied Mathematics Department at Witwatersrand, where he advanced to senior lecturer, at the same time developing geophysical research in a number of topics, notably seismology. He gained a PhD from the University of Cape Town, for geophysical studies. World War II interrupted his scientific career, and he served as an engineering officer in the North African Campaign, exploring for sources of fresh water.

After the war, Hales spent time at the Bernard Price Institute of Geophysical Research at Witwatersrand, involved with seismic equipment development, and gravity measurements using pendulums, and then returned to Cape Town as professor and head of the Applied Mathematics Department. In 1954 he was appointed director of the Bernard Price Institute, and put great energy into advancing a number of geophysical methods, including paleomagnetism. This latter was particularly important in that it anticipated the demonstration of continental drift from measurements of the Earth's past magnetic field. He recognised that it was important to obtain paleomagnetic data from different continents and he played an advisory role in establishing this research activity at ANU that led to the demonstration by Ted Irving that continental drift had occurred in the geological past.

In 1962 Hales moved to the USA where he became first head of a new geoscience program at the Southwest Center for Advanced Studies (later the University of Texas) at Dallas. This decade was one of great activity in geophysics and geochemistry, and Hales made his laboratory a front-runner in a number of key areas. This included seismology, in which he conducted experiments in North and South America designed to understand the structure of the crust and upper mantle, an interest that he developed further at ANU. The American experiments involved the use of explosives as energy sources for the seismic waves recorded at variable distances from the source. When he left Texas his students presented him with a photographic record of his field experiments, including made-up newspaper headlines about running explosives across the US-Mexico border. Later in Canberra this record was lost, having been left on his car roof, and was only returned after it had been handed in to the Canberra Times!

After 11 years building a new department and a new university in Texas, Hales, at the age when most people are contemplating retirement, was convinced by Professor Ted Ringwood that ANU represented a new challenge for him. He

established the RSES and created new chairs in economic geology (Lew Gustafson) and geophysicial fluid dynamics (Stewart Turner) and was also able to fill the geophysics chair (Kurt Lambeck) vacated earlier by John Jaeger. He was a strong supporter of a non-departmental structure for the school such that the science would not be contained within the traditional boundaries. He encouraged instrumental developments, most notably in mass spectrometry, and made it possible for Bill Compston to develop the ion microprobe SHRIMP, which has become one of the great success stories of RSES.

Hales also actively pursued science that was focused on the Australian continent and its setting, both in field studies and in laboratory analyses, and much of today's seismology research at ANU has its origins in the projects set up by him then. At the same time he advocated the global nature of Earth science. He encouraged his staff to become globally engaged and led by example, serving as president of the Inter-Union Commission on Geodynamics and being active in the International Union of Geodesy and Geophysics.

For some years after his retirement from ANU in 1978, Hales resumed his research activities in Dallas as a professor of geosciences, at the same time maintaining his home in Canberra, where his family had settled, and his two younger sons were at school. He retired from Dallas in 1982, and back in Australia his energies then went into establishing a new family house and garden on a bush block in Wamboin, New South Wales. This was not without its own excitement, including removal of ladders when his wife was on the roof cleaning gutters, but it provided him with an outlet for his tremendous energy that remained with him and an interest in plants and animals. His geophysics interests continued with him contributing in a visiting position at RSES in which he provided guidance to young staff and new directors alike, notably in the latter case only when asked.

Hales's career spanned much of the 20th century, and he was active in a major and remarkable scientific advance, which saw the demonstration and recognition of the mobility of the Earth over long times, exemplified in the, now accepted, theory of plate tectonics. His scientific honours include fellowship of the Royal Society of South Africa, the American Geophysical Union, and the Australian Academy of Science. They indicate the esteem in which he was held in these three continents, where he had developed three distinguished careers.

Anton Hales died on 11 December 2006. He is survived by his second wife Denise, three sons, and seven grandchildren. Denise was strongly supportive throughout this marriage and at Wamboin she provided the environment, love and care that permitted him to enjoy his retirement up to the end.

Kurt Lambeck
Ted Lilley

Sefton Davidson Hamann

Elected to Fellowship 1966

On 13 January 2003, at the age of 82, Dr Sefton Hamann fired off a missive to his friend Bill le Noble in Stony Brook New York,

> A habit of Firestone's that annoys me intensely is the way in which he gaily dismisses, or bends to his ends, or just ignores, anything that seems to trouble his arguments. And he gets away with it!

But he didn't get away with it this time! After months of careful analysis of all the available experimental results, Sefton and le Noble were able to show that the phantom activation volumes claimed by Firestone did not exist. Their paper was published in *The Journal of Physical Chemistry A* in 2004. This was the last of Sefton's scientific publications.

Dr Sefton Davidson Hamann was born in Christchurch, New Zealand on 8 January 1921, the youngest by 18 and 20 years of three children. He studied for a BSc in chemistry and physics at

Canterbury College. His studies were interrupted when he volunteered for service in the Royal NZ Navy in August 1941. He served until February 1946. For about 18 months during the war he was seconded to New Zealand's Department of Scientific and Industrial Research (DSIR) to carry out research on microwave radar. During this secondment he spent six weeks at the Council for Scientific and Industrial Research (CSIR) Radiophysics Laboratory in Sydney. During his time in the Navy he was under the command of Lieutenant Commander EJ Marklew who wrote,

> ...He was responsible for independent development and scientific investigation and contributed in no small manner to the success of Radar sets developed in New Zealand… he served in the Solomon Islands and carried out important duties in the fitting of sets in cruisers and small ships at the Devonport Naval Base.

Dr Hamann gained an MSc with first class honours from the University of New Zealand in 1947 and worked at the Dominion Laboratory in Wellington. During this time he revisited the CSIR Radiophysics Division in Sydney. At this stage in his career he chose to develop his interest in solution chemistry and went to the University of Manchester to pursue a PhD, which he gained in 1949.

He must have enjoyed his experiences in Sydney because in 1948 he wrote to Dr Ian Wark, the Chief of the CSIR Division of Industrial Chemistry, asking if there were going to be positions available at the end of 1949. Wark got Dr Keith Sutherland to interview him in London and he was duly appointed to a position in Sydney commencing 5 January 1950.

He was rapidly promoted within the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and was invited to take the position of chief of the Division of Physical Chemistry in 1960. The divisions of physical and organic chemistry merged to form the applied chemistry division in 1966 and he retained the position of chief until 1974 when that new division was separated into the divisions of applied organic chemistry and chemical technology. He was the chairman of the Applied Chemistry Laboratories until 1978 and retired from the organisation in July 1983. All his post PhD papers had a CSIRO address except the one above published in 2004.

He was elected a Fellow of the Royal Australian Chemical Institute (RACI) in 1964, awarded RACI's highest medal for science, the HG Smith Memorial Medal in 1969 and elected a Fellow of the Australian Academy of Science in 1966. An indication of his international standing was the invitation to present a paper on *Properties of electrolyte solutions at high temperatures and pressures* at the 1979 Nobel symposium.

Sefton made outstanding contributions to our understanding of the effects of pressure on chemical reactions. His book, *Physico-chemical effects of pressure* was published in 1957 and is still being cited 50 years later. This book was a comprehensive survey and analysis of the effects of pressure on volume, phase changes, viscosity and diffusion, dielectric and optical properties and chemical kinetics. His view at the time was that all the theory behind the physico-chemical effects of pressure had not been developed. He spent much of his scientific career developing and testing that theory.

A meeting was held on Monday 9 April 1968 at the Reserve Bank of Australia's Melbourne office that would change the course of Sefton's career as well as the careers of many other CSIRO scientists.

The then governor of the Bank, Dr HC (Nugget) Coombs called the meeting of his top note printing staff and seven of Australia's top scientists to discuss ways of devising techniques to produce notes which would be difficult to counterfeit. Sefton Hamann was invited to attend the meeting, and of those present, he was the only one who stayed with the project to its conclusion. Dr David Solomon was invited to the second meeting which was held in Thredbo on 15 to 16 June 1968 and so commenced a long and exciting collaboration that resulted in the release of the $10 commemorative note in 1988 and the conversion of all our banknotes to a polymer substrate by the mid 90s. Sefton concentrated his work on diffraction gratings and moiré patterns, not for the purpose mentioned at the first meeting, but as security devices in their own right. A Captain Cook diffraction grating was incorporated in the 1988 banknote.

Sefton's legacy is his science. Keith Sutherland summarised Sefton's contribution succinctly in writing a promotion case in 1957,

> Hamann has the ability to strip problems to a few essential features which, when investigated, clearly illuminate a wide group of phenomena.

Sefton died on 12 January 2009. He is survived by his son Conrad, daughter-in-law Christine and two grandchildren.

Tom Spurling
David Solomon

Phillip Garth Law

PHOTO: PAT QUILTY

Elected to Fellowship 1978

Law was born on 21 April 1912 in Tallangatta, Victoria, near the family home in Mitta Mitta, the second of six children. He died on 28 February 2010 at Balwyn, a Melbourne suburb, eight weeks before his 98th birthday. He was the son of Arthur James and Lillie Lena (née Chapman), both teachers by profession.

Throughout his growing years, Phil was haunted by his small stature and within the family was always 'little Phil', later 'Squib'. This small size meant that he was excluded from some of the activities of the 'big' boys even of the same age and in the same class at school. Probably because of the treatment, he developed some of the 'small man syndrome' and had to perform in some areas, both physically and academically, at a higher level than those around him, a practice that never left him.

Throughout life, Law tackled every new challenge, be it sport, music or administration, with enthusiasm, dedication and ability. In every area, Law strove to excel, often at considerable cost. Like so many of his generation, he completed high school in time for the Depression and thus took up teaching as an employment option.

He was introduced to the world of natural sciences on an excursion with Dr Charles Fenner, father of Professor Frank Fenner, but eventually chose physics as his field.

After qualifying at the University of Melbourne, Law recognised that he could be little more than a 'competent, well organised routine scientist' within the University system and began to apply for administrative positions. This led to his attraction to the newly established Antarctic Division (AD) of the Department of External Affairs, which he joined in 1947 as chief scientist, soon to be promoted to director.

Under Law's guidance, a diverse scientific program evolved with the AD fulfilling two roles – as both logistic support, and as an institution with its own scientific program. Law believed strongly that the director of the AD should be a scientist who was actively involved in the program. He saw the link between Australia and Antarctica in many disciplines and, in some way, may have been influenced by that other dominant Australian Antarctican – Douglas Mawson. Like Mawson, Law was not interested in science entirely for its own sake; it had to have a practical side including the use of Antarctica as a source of wealth (geological resources, fishing) or of other practical uses such as storing nuclear waste or excess agricultural production.

Law was a man of grand vision and he pursued it with enthusiasm but was frustrated with the inability of the government service to react to urgent needs. He thus took many shortcuts to achieve his aims. It is unlikely that he would be able to get away with this approach in the modern public service.

Law oversaw the establishment of stations on Macquarie and Heard Islands (1947; the latter closed in 1954) and on the Antarctic mainland at Mawson (1954) and Davis (1957). The mainland stations placed Australia in very good stead for the International Geophysical Year (1957–58). Wilkes was taken over from the USA and became the site of Casey.

Law's contribution to science stems from two facets. When he was establishing Antarctic facilities, geographic exploration, including delineating coastline and near coastal features (glaciers, mountains) was to the fore and his dedication to accurate astrofixes was critical.

Once stations were in place, diverse scientific programs developed, taking advantage of local opportunities under the umbrella of the Australian National Antarctic Research Expeditions (ANARE). He believed in cooperation between members of small communities and resultant papers often had authors with apparently widely different specialties.

Thus, while Law published few scientific papers under his own name, he can be regarded as the source of all.

Law is without peer the outstanding Australian in the modern Antarctic period, best known for his role in establishing the reputation and traditions for the Australian program. Even several decades after his retirement, Law was the most widely recognised face of the program, widely called on to speak on the topic, and to contribute to Antarctic conferences and workshops. The list of his awards, and their international character, attest to his standing.

He was a prolific diarist and keeper of records and thus comprehensive reviews of his life and impacts are readily available. He also published several books. He enjoyed a good red wine and his legendary cigars.

Perhaps through family and his own teaching experience he had a long interest in education at all levels, and in his later days at the AD much of his time was spent on education committees. He applied for higher university positions, leading ultimately to his resignation and move to the Victorian Institute of Colleges (VIC). Law's role in the VIC has been overshadowed by his Antarctic persona and deserves to be better known.

As he aged, he became very stooped and appeared frail, but if a microphone was placed within reach, the voice and mental acuity of the past were very obvious.

His many awards include the following: Founder's Gold Medal, Royal Geographical Society of London (1960); Commander of the Order of the British Empire (CBE) New Year's Honours (1961); Doctor of AppSc *honoris causa*, University of Melbourne (1962); Officer of the Order of Australia (AO) (1975); Foundation Fellow, Australian Academy of Technological Sciences and Engineering (1975); Fellow, Australian Academy of Science (1978); Companion of the Order of Australia (AC) (1995).

In typical Law fashion, prior to his death he organised a post-expiration dinner for some 160 of his 'friends' at the headquarters of the Melbourne Cricket Club, on what would have been his 98th birthday. It is believed that he chose the wines, speakers, menu and the list of invitees. This event was followed two days later by a memorial afternoon hosted by the ANARE Club of which he had been patron for so long.

Because of his wife Nel's heart condition, the Laws agreed not to have children so there are no direct descendants.

At a ceremony in Hobart, the ashes of both Phil and Nel were handed to the Australian Antarctic Division to be taken to Antarctica and placed on West Arm at Mawson, Law's first station established on mainland Antarctica.

Patrick Quilty

Arthur Melville (Mel) Thompson

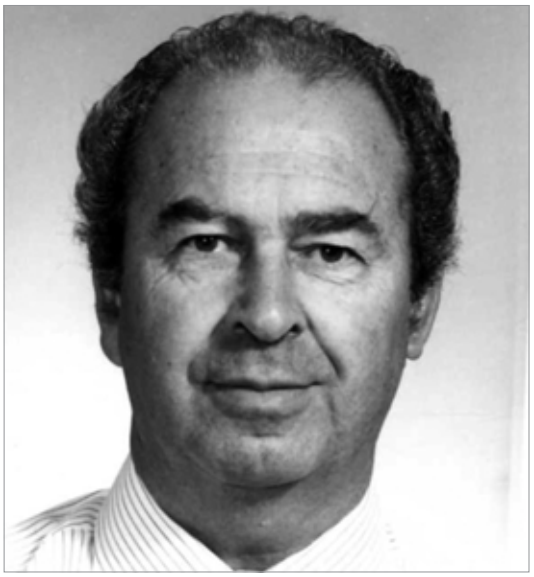


PHOTO: BARRY INGLIS

Elected to Fellowship 1972

Mel Thompson was born in Adelaide on 4 January 1917 and died in Sydney on 8 August 2009. Mel was educated in Adelaide and received a BSc Honours degree with first class honours in physics, from the University of Adelaide in 1938. Following graduation he worked for a year as a demonstrator in the physics department at the University of Adelaide on a CSIR grant before taking up a CSIR studentship in 1940. Under the studentship he received training in electrical measurements at the National Physical Laboratory in the UK and the National Bureau of Standards in the USA, now the National Institute of Standards and Technology. Mel returned to Australia in 1941 and was appointed to the research staff in the electrotechnology section of the National Standards Laboratory (NSL). He rose through the research scientist ranks to be appointed chief research officer in 1962 and chief research scientist 2 in 1971. After retiring in 1982

he continued his research for a further year as an honorary senior research fellow.

During his early days at the NSL he was engaged in defence work related to magnetic mines on behalf of the Australian Navy. However, the main focus of his illustrious career was on precision electrical measurements and electrical standards. In particular, he developed new bridge measurement techniques and impedance design techniques that advanced the state of the art by several orders of magnitude and continue to be the basis of precision impedance measurement technique to this day. Perhaps his greatest contribution, and the one for which he gained greatest recognition, came in the early to mid 1950s with his conception of a calculable capacitor design requiring measurement of only a single linear dimension. While working with DG Lampard on the calculation of capacitance of this design they realised that the design could be generalised. This gave rise to a new theorem in electrostatics, known as the Thompson-Lampard theorem that was published in *Nature* in 1956. The interest in developing new calculable capacitance standards at NSL was part of a larger program to realise absolute values for the units of capacitance (farad) and electrical resistance (ohm). The Thompson-Lampard capacitor put Australia in advance of the rest of the world in this field and really put NSL on the international map. The Thompson-Lampard capacitor and Thompson's novel bridge techniques were rapidly taken up by other national measurement institutes around the world and continue to be used as the basis for capacitance measurement. There is currently a new generation of these capacitors being developed at the National Measurement Institute, Australia in collaboration with the International Bureau of Weights and Measures (BIPM).

Mel was one of eight founding father appointees at the NSL. He was an outstanding scientist who made major contributions of international significance in electrical metrology. Indeed, the high international standing that NSL – and later the CSIRO Division of Applied Physics, the National Measurement Laboratory and currently the National Measurement Institute – enjoys is in no small measure due to his work.

Mel was elected to the Fellowship of the Academy in 1972. He received many other honours and awards, including the Instrument Society of America's Albert F Sperry Medal (with DG Lampard) in recognition of their contributions to the improvement of fundamental international standards of capacitance and resistance resulting from their development of a new theorem in electrostatics, and its application to the design of a calculable standard of capacitance (1965); an honorary *doktor-ingenieur* conferred by the Technical University of Hanover for outstanding contributions to electrical measurements (1968); the IEEE Morris E Leeds Award for outstanding advances in absolute electrical measurements, particularly capacitance and resistance (1977); and a Centenary of Federation Medal (2003).

Mel is survived by his wife, Joan, and his children, Marc and Haydn.

Barry Inglis

Donald Eric Weiss

Elected to Fellowship 1971

Don Weiss was born in St Kilda, Melbourne on 4 October 1924. He was the only child of Herbert Vernon Weiss, a librarian, and Lillian (Lill) Kate née Le Lievre, a school teacher. After his parents separated when Don was three, Don and his mother moved to Adelaide to live in a house owned by his mother's older, widowed sister, Nellie Moyes. Nellie's son Owen and Lill's younger sister Florence, who like her two sisters was a school teacher, also lived in the house.

Don attended the Mitcham Primary School where he played the fife in the school band. He commenced his secondary education at Scotch College, Adelaide, in 1937 and completed

his leaving certificate in 1941. He graduated from playing the fife to the flute and in 1941 was the first flautist in the school orchestra. He maintained a lifelong interest in the flute. He was not very interested in studying until introduced to chemistry by two first class teachers, John E Smith and John Dow. In his last year at Scotch College he won the science prize, and shared the mathematics prize and the special English prize.

Don decided at an early age that he was going to be an industrial chemist and so enrolled in the Diploma of Industrial Chemistry at the South Australian School of Mines and Industry (now part of the University of South Australia). He transferred to a BSc course at the University of Adelaide in 1944 and graduated in 1945. He was awarded a DSc from the University of Adelaide in 1960.

Don was employed as a shift chemist at the Australian Pulp and Paper Manufacturers mill at Burnie, Tasmania from 1945 to 1946, and then as a development chemist at the Commonwealth Serum Laboratories in Melbourne. He was engaged in experimental laboratory and pilot plant investigations of penicillin production. Don met Richard Thomas, a CSIR scientist, at a RACI meeting and they discussed Don's design for a device to carry out continuous fractional precipitations. Thomas talked about this to his chief, IW Wark and soon after Don was recruited to the CSIR Division of Industrial Chemistry to commence on 2 January 1948. He remained with CSIR/CSIRO for the rest of his career.

Don achieved rapid promotion in CSIR/CSIRO. In 1971 he was appointed assistant chief of the Division of Applied Chemistry, and then in 1974 was appointed chief of the newly created Division of Chemical Technology. He remained in that position until 1979 when he was invited to become the director of CSIRO's planning and evaluation advisory unit. He retired from CSIRO in 1984.

Don was a very active member of RACI. He was the president in 1983 and is the only person to have won all four flagship medals of RACI. He won the Rennie Memorial Medal in 1950, the HG Smith Memorial Medal in 1966, the Leighton Memorial Medal in 1977 and the Applied Research Medal in 1980. He was also active in the Society of Chemical Industry of Victoria and the UK-based Society of Chemical Industry (SCI). In 1992 the SCI gave him a special award for 'innovative contributions to ion-exchange technology and its application in practice'. Don was involved in the Australian Water and Waste Water Association and the International Association for Water Quality Pollution Research, being the Australian branch president in 1979. He was a foundation Fellow of the Australian Academy of Technological Sciences and Engineering.

Don devoted his entire scientific career to separation science. He was trying either to recover a valuable component from a dilute solution or mixture or to separate impurities from a valuable solvent. His work was always user driven and he never thought that his work was complete until it was embodied in a plant operating on a commercial basis. This was often frustrating because the companies with which he worked often changed their direction before Don's technology could be implemented. Setbacks were only ever temporary; Don's natural enthusiasm drove him to the next problem.

Delegates at the Fifth Empire Mining and Metallurgical Congress which was held in Australia in 1953 were shown Don's continuous water softening system and some of them saw that the system had potential for the direct recovery of uranium from a slurry of leached minerals ores. After some negotiations, Don obtained a security clearance to visit plants in the Colorado desert where he gained a better understanding of the needs. In collaboration with the Australian Atomic Energy Commission (now ANSTO) and Consolidated Zinc Pty Ltd (now Rio Tinto Ltd) Don developed a counter current ion exchange plant which extracted uranium ions. The technology was licensed to the Permutit Company but was never implemented by Consolidated Zinc. The work begun by Don was continued in Russia and Japan, where Asahi developed from it the first commercially successful continuous ion-exchange process for boiler feed and industrial water treatment. The Newport power station in Melbourne contains this equipment.

In the early 1960s Don turned his attention to municipal water treatment. He studied the needs and markets carefully, visiting water authorities in Melbourne, Adelaide, Perth, Sydney and Brisbane. He decided to concentrate on developing technologies to treat the predicted rise in salinity of water supplies in Perth and Adelaide. This became his main scientific interest for the rest of his career.

Don and his collaborators developed many processes for water and waste water treatment.

The first was Sirotherm, whereby salt is extracted from brackish water by a mixture of weak acid and certain weak base resins which are then rinsed with hot water. Heating the weak base changes its basicity causing the adsorbed ions to be released as a more concentrated effluent. Two types of resin were used in separate pilot plants: 'plum pudding resins' had the micron sized active resins dispersed within a porous matrix bead of standard size, and 'magnetic resins' where micro-beads of resins contained a proportion of gamma iron oxide. Unmagnetised these resins dispersed but when passed through a magnetic field they flocculated and settled rapidly. The Sirotherm process was not a commercial success.

In the mid 1970s he realised that the removal of colour and turbidity from ground and surface waters was a problem. He and his collaborators discovered that magnetite particles themselves could absorb colour and turbidity and the 'Sirofloc' process was developed. Commercial plants were constructed in Tasmania, New Zealand, England and Ireland. The Esk Valley Water Authority in northern Tasmania is still operating a 'Sirofloc' plant.

The concept of magnetic ion exchange resins was further developed by the CSIRO Division of Chemical Technology (and its successors, the Divisions of Chemical and Wood Technology, Chemicals and Polymers and Molecular Science) and is now licensed to Orica. MIEX technology, as it is now called, has been successfully applied for the removal of dissolved organic carbon from potable water sources. More than 20 plants have been installed around the world.

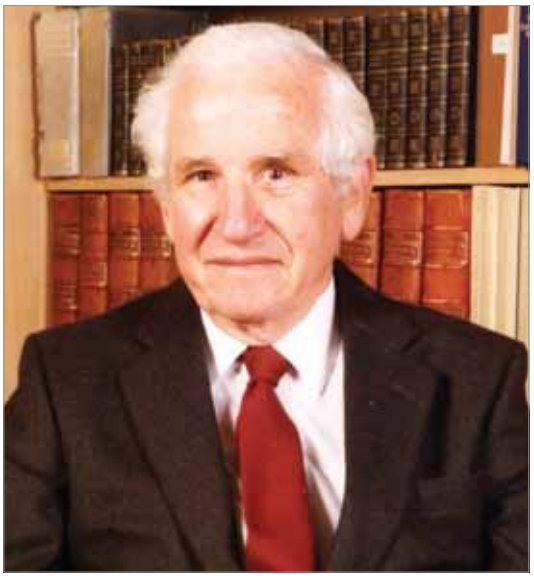
Don initially tried an electrochemical approach to the regeneration of ion-exchange resins using activated carbon electrodes. In pursuing this goal, Don and his collaborators reported a substituted polypyridine with a remarkable resistivity of 0.03 ohm cm. These polymers could not be applied to desalination so Don abandoned this line of enquiry. This was unfortunate because conducting polymers were rediscovered in 1977 by Heeger, MacDiarmid and Shirakawa, who won the 2000 Nobel Prize in Chemistry.

Don was a creative and enthusiastic scientist. He was a tall man and a towering presence in more ways than one. He never seemed to join in ordinary conversations; his brain was always employed elsewhere. He was fortunate in having many loyal and talented collaborators to assist in bringing his ideas into practice. He was infallibly courteous towards his colleagues and assistants. The many MIEX plants operating around the world are a testament to the strength of his ideas and to the value of perseverance.

Don married Betty Axford Evan in 1951. They had two sons – Robert Andrew, born in 1952, a chemical engineer and Peter William, born in 1956, an architect. Don had three grand-daughters and a grandson. Don died on 30 July 2008. Betty died in 2010.

Tom Spurling

Wesley Kingston Whitten



Elected to Fellowship 1982

Wes Whitten was born at Macksville, New South Wales on 1 August 1918. He was educated at the East Maitland Boys High School and later the University of Sydney where he graduated with a BVSc with honours in 1939 and BSc in 1941. After four years (1941–45) in the Australian Army, first as a captain in the Veterinary Corps and then as officer-in-charge, Land Headquarters Food Laboratory, he joined CSIRO in 1946 to work on infertility in sheep particularly the infertility associated with grazing clover dominant pastures. In 1949 he was appointed to supervise the breeding of laboratory animals in the John Curtin School of Medical Research at the ANU and to carry out cognate research. In this position Wes made significant contributions to understanding the metabolism of embryos and designed a completely synthetic medium (Whitten's medium) for the world-first culture of mammalian embryos. Wes's

contributions in this area have proved seminal in the development of assisted reproductive technologies in Australia and worldwide. He also made major findings in the endocrine control of embryonic implantation and the role of pheromones in reproduction (Whitten effect) via the vomeronasal organ. For these studies he was awarded a DSc by the University of Sydney in 1962.

His research interests also included possum and seal reproduction and in 1958 he spent three months studying elephant seals on Macquarie Island. In 1961 Wes resigned from the ANU to become assistant director (endocrine products) at the National Biological Standards Laboratory in Canberra. In 1966 Wes moved to Bar Harbor, Maine, USA to work at the Jackson Laboratory, famous for its work on genetics and physiology of mice. This work has greatly enhanced the role of laboratory mice as models in the study of human genetics, physiology, immunology and disease processes. He was senior staff scientist and associate director of research and with colleagues published numerous papers on the breeding and physiology of mice, much of which has been applied in the field of fertility and assisted reproductive technology in humans. With Dr David Whittingham he pioneered the freezing and international transport of embryos. In collaboration with colleagues at Dalhousie University in Canada he continued to pursue his interest in pheromones and their significance in animal reproduction and behaviour. The Memorial University of Newfoundland awarded him an honorary DSc in 2001. Wes published over 100 papers in major scientific journals and was assistant editor of *Biology of Reproduction* and *Journal of Experimental Zoology*.

Wes retired in 1979 and returned to Australia. First he lived in Hobart where he played a major part in setting up a successful IVF laboratory and then in 1980 moved to Canberra where he continued an active interest in research at laboratories of the ANU and CSIRO. He held honorary appointments in the Department of Zoology, University of Tasmania; the John Curtin School of Medical Research at ANU; the Cooperative Research Centre for Biological Control of Vertebrate Pest Populations; and the Medical School at Memorial University, Newfoundland, Canada.

Wes was elected to the Australian Academy of Science in 1982. In 1993 the Society for the Study of Fertility awarded Dr Whitten the Marshall Medal, the society's premier award, which was established in 1963 to be awarded 'from time to time by the society to outstanding contributors to the study of fertility and reproduction'. The International Embryo Transfer Society awarded him the society's Pioneer Award in 1996. In 2009 the ANU named its new world-class animal breeding facility the Wes Whitten Building in honour of his outstanding contributions to biomedical science.

Wes was an enthusiastic swimmer and surfer, and a keen bushwalker and canoeist. He married Enid Elsbeth Cay Meredith in 1941 and had two sons (Greg and Mark) and two daughters (Jane and Penny). After Beth passed away in 1999 he married Jocelyn Mary Taylor, a long-standing friend and colleague, in 2001 and lived in Oregon, USA until failing health compelled him to return to Canberra in 2008 to be nearer his family.

Wes died on 24 May 2010. He is survived by Greg, Mark, Jane and Penny, five grandchildren and two great-grandchildren.

Jim Shelton

(John) Paul Wild

PHOTO: PENNY WILD

Elected to Fellowship 1964

Paul Wild was born on 17 May 1923 in Sheffield, England, the son of a cutlery manufacturer who lost everything in the Depression. As Paul described it, the family went from riches to rags. Paul's father went to the US to sell his patents but never returned, although he was able to provide support once his financial dealings were done. An early gift of a Hornby train from his mother started Paul on his lifelong love of trains. Paul described three early

ambitions – to be a train driver on a King Class locomotive, to be an opening batsman for Yorkshire and to become a Fellow of the Royal Society and as he said, 'I only achieved the third'.

Paul had an early love of mathematics and attributes much to his school mathematics teachers. When he went to Cambridge in 1942, he took mathematics and then, 'to do something useful for war service' went straight into part two physics, which he greatly enjoyed, and at the end of the year joined the Navy. He was proud of having only ever spent five terms at university. After a year away he was given a BA and later paid £5 to convert it to an MA.

Paul became a radar officer on the flagship HMS *King George V* in the British Pacific fleet and spoke of making his name by explaining to his captain (the Admiral) at a critical moment that 'normal' meant 'at right angles to' and then watched on radar as the whole fleet turned through 90 degrees.

It was during visits to Sydney that Paul met Elaine Hull and became engaged to marry her – a good reason to come to Australia. After the war he returned to England and taught radar to naval officers until, in 1947, he obtained a job at the Radiophysics Laboratory of CSIR in Sydney, to maintain and develop test equipment. After a year in this role, he was able to get into radioastronomy research with Joe Pawsey's group. Paul was a great admirer of Pawsey, 'He just provided ideal conditions, an ideal environment to allow everyone to use their own initiative'.

In his then role as an assistant research officer, Paul was able to start his work in solar radioastronomy. He worked with Lindsay McCready and, at Pawsey's suggestion, built a spectrograph to study solar bursts. This instrument would allow a display of frequency versus time covering a swept frequency range from 40 to 70 MHz. With this instrument, they identified and named three types of bursts – types I, II and III, distinguished by the way the frequency drifted with time and published a series of papers in 1950. They deduced that the type II bursts were associated with shock waves coming out through the solar atmosphere at 1000 km/sec and were associated, 30 hours later, with aurora in the Earth night sky. They associated type III bursts with streams of electrons being ejected at a third the speed of light and taking only an hour to reach the Earth. The mechanisms proved to be correct and their naming of the phenomena became the standard. Paul likened this research to the study of taxonomy that preceded Darwin's 'Origin of species'. His analysis of the anatomy of the solar flares and his development of the physical interpretation culminated in a unified model which integrated the apparently complex radio flare phenomena in the solar chromosphere, solar corona, and in the interplanetary space.

In the course of this solar work, Paul became interested in the radio spectrum of hydrogen and wrote up an internal report related to the potential for spectral lines in the solar bursts. When Ewen and Purcell in the USA first observed the 1420 MHz transition in 1951, Paul went back to his report, generalised it to include the interstellar medium, and six months later published the first detailed theoretical paper on the hydrogen lines – a classic in the field. The assistant research officer had come a long way in the brief period since 1947. After 10 years of research, Paul's collected papers gained him a DSc degree from Cambridge University. The group was the pre-eminent group in the world for solar radioastronomy and would continue their work for three decades.

All the results had been inferred from the spectral observations and there was a growing desire to be able to image the sun at the same range of frequencies with angular resolution comparable to the human eye. This dictated the need for an instrument more than a million times the size of the aperture of the human eye – three kilometres across. With Pawsey's help, £630,000 was raised from the Ford Foundation to build a radioheliograph at Narrabri in northern New South Wales. Paul acknowledged his friend Kevin Sheridan, chief electronics engineer, as the key figure in this development. The heliograph stayed in operation for 17 years from 1967, providing a tremendous amount of data and insight into the way the solar corona works and the relationship between solar and terrestrial phenomena. Paul published more than 70 papers in this area, and was elected a Fellow of the Royal Society of London in 1970.

In 1971, Paul took over from EG (Taffy) Bowen as chief of the Division of Radiophysics. While continuing his interest in the solar area, he now looked around for opportunities to use the skills gained from the radioastronomy work and to provide a balance of pure and applied work in the Division. Discussions with Egon Stern from the Department of Civil Aviation identified a replacement for the ILS (Instrument Landing

System) as a key opportunity, which was taken up with great enthusiasm by Paul. This work led to the Interscan System, ultimately accepted as the new global standard in 1978.

Paul was appointed chairman and chief executive of CSIRO in 1978, the last person to hold both titles. As chairman of CSIRO from 1978 to 1985, Dr Wild was a national science leader. He led the organisation through the restructure designed in 1978 to modernise it and bring it closer to the industries and community which it serves. He recognised that CSIRO needed to adapt and provide scientific and technological leadership in a changing world. And, as he wrote in 1984,

> Yet, whatever the changes, one characteristic must remain inviolate: a high standard of excellence and originality. Without excellence and originality, research achieves nothing.

During this period he was instrumental in securing funding for major national research facilities including the Oceanographic Research Vessel, the Australian Animal Health Laboratory and the Australia Telescope, and he established a new division of information technology. The Australia Telescope was, in fact, built on the site of Paul's radioheliograph and the observatory was named the Paul Wild Observatory.

Another project that started in this era was his Very Fast Train (VFT) project following a train trip from Sydney to Canberra. He envisaged a fast train linking Sydney, Canberra and Melbourne. He became chairman of the VFT consortium, which comprised TNT, Elders IXL, BHP and Kumagai Gumi but the project collapsed in the early 1990s when the government rejected proposals for tax benefits for infrastructure projects.

A longstanding interest of Paul's was gravitational theory. In his later years Paul published a modified Newtonian theory of gravity which is simpler than the general theory of relativity but makes equivalent predictions. Although this is acknowledged as a valid and complementary approach it has had limited impact. Paul's deep understanding of gravity theory and general relativity led him to an insight which could provide a link between the inertial and gravitational mass and a prediction of the mass density of the universe. This work was incomplete when he died.

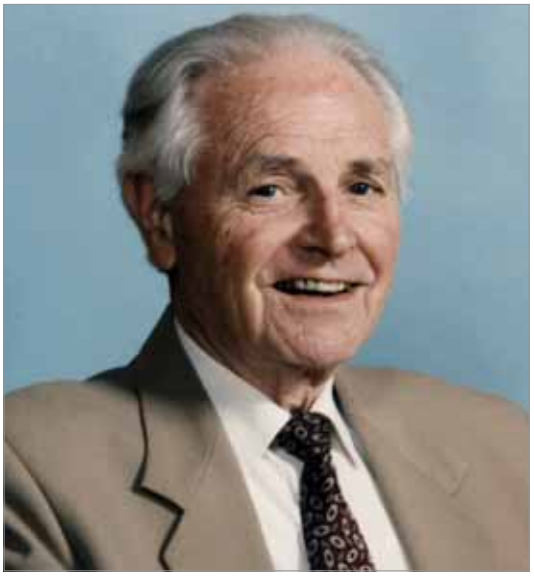
The 'big-picture' people in science, the 'system thinkers' who can see their way through the complexity to set the path are the ones who take the world forward. In this arena, Paul was in the absolute top drawer. On any technical issue – he got it! This shows through from Paul's earliest work. He clearly had an exceptional intellect, wide knowledge and a continuing and unstoppable interest in 'the new'.

Paul gained many honours. These include the Hale Prize in 1980. He was a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering and the Royal Society, a foreign member of the American Philosophical Society and a Fellow of the American Academy of Arts and Sciences. He was made a Commander of the Order of the British Empire (CBE) in 1978 and a Companion of the Order of Australia in 1986.

Paul died on 10 May 2008. He is survived by his son Peter, daughter Penny, son Tim and Tim's children Arnold and Victor.

Bob Frater
Ron Ekers

Howard Knox Worner



Elected to Fellowship 1973

Howard Worner was born at Swan Hill in Victoria, Australia on 3 August 1913 into a farming family. He received his early education at the local school and appeared to be destined for a farming career. However after a prolonged drought and the Depression the family moved to Bendigo where he attended a technical college with his two brothers, Hill and Neil. They all showed academic promise and continued on to the School of Mines where

Howard studied industrial chemistry and graduated with a gold medal in 1932. He then went to the University of Melbourne to study metallurgy and graduated with a BSc with first class honours in 1934. Appointed to the staff of the metallurgy department in 1935 he commenced research on creep of lead and was awarded an MSc with first class honours in 1936. His work led to lighter plates in lead-acid batteries and was the basis for development of delayed timing devices in World War II. After four years he moved to the Department of Health on a National Health and Medical Research fellowship to work on a wide range of dental materials. He was awarded a DSc in 1942 on the basis of his pioneering research in the area which was recognised internationally. The results laid the foundation for the Australian Dental Standards Bureau. Between 1944 and 1945 he carried out work with the services tropical scientific unit directed to improved storage of dental and surgical stores in tropical areas for the Australian Army.

In 1946 Howard was appointed as professor of metallurgy at the University of Melbourne and later became dean of engineering in 1953. He carried out research on new methods of casting high strength alloys and on electrolytic production of titanium and seemed destined for a distinguished academic career. However his strong desire to see practical application of research led him in 1955 to accept an offer from The Broken Hill Pty Co Ltd (BHP) to become director of research and establish BHP's central research laboratories in Newcastle, New South Wales. He encouraged researchers to explore new ways of processing coal and iron ore for steelmaking which led in 1960 to the concept of continuous steelmaking to replace the batch processing used at that time. He envisaged the combination of injection of reactants through pipes into a flowing stream of hot metal and slag. This concept became his personal commitment for many years. He demonstrated the concept on a trial basis at Newcastle Steelworks but failed to convince senior management of its potential since at that time there was no driving commercial urgency for such a process. Howard determined to take it further and left BHP in 1962.

After discussions with several international companies he took up the post of director of new process development for the newly formed Conzinc Riotinto Australia (CRA) Group at Cockle Creek near Newcastle in 1963. CRA's main interest was in mining copper and nickel which were more amenable to continuous processing than steel and Howard developed a range of technologies under the name of WOCRA (after WOrner and CRA Ltd). However CRA did not have smelters in Australia and the processes were exploited overseas in Europe for copper and lead, and in Japan and China for steel. He was later awarded the Metallgesellschaft Medal in Germany and the Shanghai Society of Metals Medal in recognition of his pioneering research. The concepts developed by Howard have come to fruition in Australia several decades later in the developments of SIROsmelt (after CSIRO) and ISAsmelt (after Mt Isa).

While in industry Howard recognised the need to build bridges between university researchers and industry and he fostered the formation of the Australian Industry Research Group (AIRG) linking research managers of the major Australian companies. He was elected as a Fellow of the Australian Academy of Science in 1973 at a time of considerable debate about the recognition of technologists by the Academy. Howard strongly believed in the need for a body to recognise achievements of applied scientists and engineers as existed in Europe and the United States. With an initial base from the AIRG, the Australian Academy of Technological Sciences (later, 'and Engineering' was added) was formed in 1975 with Howard as a foundation Fellow and honorary secretary, a position which he held for 10 years.

He retired from CRA in 1975 and took up a new challenge in the energy area in 1976 as chair of the Victorian Brown Coal Council where he stimulated research on low rank lignite including use as char and in production of oil from coal for a period of five years. During this period he was also chair of the Victorian Solar Energy Council and stimulated research on low energy housing and solar heating and cooling in industry. At the national level, he was chair of the National Energy Advisory Committee from 1976–77 and oversaw the production of a number of influential studies on energy issues. As a result the Australian Government established the National Energy Research Development and Demonstration Council with a substantial funding base. Howard was appointed chair from 1976 to 1977 and succeeded in effectively linking university researchers and industry. His achievements over this period were recognised by the award of a CBE in 1978.

In 1983 he moved to Wollongong for family reasons but continued links to both academies, serving as a

member of the Academy Council from 1983–85. He looked for new challenges and in 1987 he joined the University of Wollongong as an honorary professor and took up the position of director of the newly formed Microwave Applications Centre. Here he developed the EnvIRONment technique using microwaves to process sewage sludge and steelworks dust to make iron and zinc pigment. He was able to prove the concept on a small scale but it proved difficult to scale up for industrial production. A significant legacy at the university is his bequest of his minerals collection which he commenced at Broken Hill in 1932. It is one of the finest collections in Australia and he worked on cataloguing it until his death on 17 November 2006.

In 1937 he married Rilda Muller and had two sons and a daughter, namely, John, Ruth and Colin. Both Rilda and John predeceased him.

Howard received many other medals and awards during his long and productive life. He is remembered as an excellent communicator who worked naturally and easily between academic and industrial research and made lasting contributions in metallurgy, materials and geology.

Greg Tegart

Appendices

Appendix 1: *Primary Connections* unit map, January 2011

Year	Biological sciences	Chemical sciences	Earth and space sciences	Physical sciences
Curriculum focus: awareness of self and the local world				
F	**Staying alive** SU: Living things have basic needs, including food and water	**What's it made of?** SU: Objects are made of materials that have observable properties	**Weather in my world*** SU: Daily and seasonal changes in our environment, including the weather, affect everyday life	**On the move*** SU: The way objects move depends on a variety of factors, including their size and shape
1	**Schoolyard safari** SU: Living things have a variety of external features SU: Living things live in different places where their needs are met	**Spot the difference** SU: Everyday materials can be physically changed in a variety of ways	**Up, down and all around** SU: Observable changes occur in the sky and landscape	**Sounds sensational*** SU: Light and sound are produced by a range of sources and can be sensed
2	**Growing and changing** SU: Living things grow, change and have offspring similar to themselves	**All mixed up** SU: Different materials can be combined, including by mixing, for a particular purpose	**Water works** SU: Earth's resources, including water, are used in a variety of ways	**Push pull*** SU: A push or a pull affects how an object moves or changes shape
Curriculum focus: recognising questions that can be investigated scientifically and investigating them				
3	**Feathers, fur or scales** SU: Living things can be grouped on the basis of observable features and can be distinguished from non-living things	**Runny or not** SU: A change of state between solid and liquid can be caused by adding or removing heat	**Spinning in space*** SU: Earth's rotation on its axis causes regular changes, including night and day	**Heat** SU: Heat can be produced in many ways and can move from one object to another
4	**Plants in action*** SU: Living things have life cycles SU: Living things, including plants and animals, depend on each other and the environment to survive	**Material world*** **Package it better*** SU: Natural and processed materials have a range of physical properties; these properties can influence their use	**Buried in time** SU: Earth's surface changes over time as a result of natural processes and human activity	**Smooth moves** SU: Forces can be exerted by one object on another through direct contact or from a distance
5	**Adaptations** SU: Living things have structural features and adaptations that help them to survive in their environment	**Solids, liquids and gases** SU: Solids, liquids and gases have different observable properties and behave in different ways	**Earth's place in space** SU: The Earth is part of a system of planets orbiting around a star (the sun)	**Light fantastic*** SU: Light from a source forms shadows and can be absorbed, reflected and refracted
6	**Marvellous micro-organisms** SU: The growth and survival of living things are affected by the physical conditions of their environment	**Change detectives** SU: Changes to materials can be reversible, such as melting, freezing, evaporating; or irreversible, such as burning and rusting	**Earthquake explorers** SU: Sudden geological changes or extreme weather conditions can affect Earth's surface	**It's electrifying** SU: Electrical circuits provide a means of transferring and transforming electricity **Essential energy** SU: Energy from a variety of sources can be used to generate electricity

Note: Darker boxes indicate published *Primary Connections* units. Units with * will need some modification to align with the Australian Curriculum Science understanding (SU) strand. Lighter boxes indicate new units to be published 2011–12.

Appendix 2: ICSU delegates

The Academy appoints voting delegates to the business meetings of ICSU's international scientific unions and interdisciplinary bodies, on the advice of the national committees. Delegates for 2010 are listed here.

Committee	Union/conference	Date	Location	Delegate
Antarctic Research	Scientific Committee on Antarctic Research	30 July – 11 August	Buenos Aires, Argentina	Professor Bob Vincent FAA
Biomedical Sciences	International Union of Toxicology	11–15 July	Barcelona, Spain	Professor Mick McManus
	International Union of Basic and Clinical Pharmacology	17–23 July	Copenhagen, Denmark	Dr Ray Morris Professor Kathie Knights Dr Sab Ventura
	International Union of Immunological Sciences	22–27 August	Kobe, Japan	Professor Miles Davenport Dr David Tarlinton Dr Susanne Heinzel
Data in Science	Committee on Data for Science and Technology	24–27 October	Cape Town, South Africa	Professor Jane Hunter
Earth System Science	Scientific Committee on Oceanic Research General meeting	17 September	Toulouse, France	Dr John Volkman Dr Trevor McDougall FAA Dr Chris Battershill
Mathematical Sciences	International Mathematical Union	16–17 August	Hyderabad, India	Professor Nalini Joshi FAA Professor Brendan McKay FAA Professor Tony Dooley
Mechanical Sciences	International Union of Theoretical and Applied Mechanics	August	Paris, France	Associate Professor Jim Denier Professor Scott Sloan FAA
Space Science	Committee on Space Research	18–25 July	Bremen, Germany	Professor Iver Cairns
	Scientific Committee on Solar-Terrestrial Physics	12–16 July	Berlin, Germany	Professor Brian Fraser

Appendix 3: Scientific visits to Europe 2010–11

Recipients of the Australian Academy of Science's scientific visits to Europe 2010–11

Australian researcher	Research project	Host
Associate Professor Ian Anderson University of Western Sydney	New insights into the eucalypt *Pisolithus symbiosis* via bioinformatics analysis of transcriptomic and genomic data	Professor Francis Martin INRA, Nancy, France
Dr Justin Boddey Walter and Eliza Hall Institute of Medical Research	Protein export by malaria parasites during liver cell infection	Dr Maria Mota Institute of Molecular Medicine, Portugal
Dr Jason Bragg CSIRO	Linking systems biology and population genetics to understand complex trait evolution in stable and variable environments	Professor Dr Andreas Wagner University of Zurich, Switzerland
Dr Michael Caley Australian Institute of Marine Science	Regional variation of the effects of global change on marine ecological communities	Professor Jean-Marc Guarini Oceanological Observatory of Banyuls, France Dr Nicolas Loeuille University of Paris, France

Australian researcher	Research project	Host
Dr David Clifford CSIRO	Novel chromatogram alignment methods for metabolomics in grape and wine research	Dr Ron Wehrens Istituto Agrario di San Michele All'Adige (IASMA), Italy
Dr Claudio Delle Piane CSIRO	Low frequency elastic properties of shales under in situ conditions	Professor David Mainprice Swiss Federal Institute of Technology (ETH), Switzerland
Dr Bryan Fry University of Melbourne	Temperature specific adaptations of Antarctic octopus venoms	Dr Dessi Georgieva University of Hamburg, Germany
Dr Roslyn Gleadow Monash University	New approaches to limiting the expected increases in toxicity of the tropical crop cassava in response to climate change	Professor Doyle McKey Université de Montpellier II, France Professor Birger Moller University of Copenhagen, Denmark
Associate Professor Andrew Hill University of Melbourne	Investigating the role of the prion protein as a receptor for A beta oligomers	Professor Catia Sorgato University of Padova, Italy
Dr Vera Ignjatovic University of Melbourne	The effect of ageing on the changes in platelet proteome	Dr Angel Garcia Alonso University of Santiago de Compostela, Spain
Dr Dianne Jolley University of Wollongong	Metals toxicity in marine microalgae: understanding the effect of metal exposure on the lipid composition of algal cell membranes	Dr Helene Hegaret Institut Universitaire Européen de la Mer, France Assistant Professor Edouard Kraffe Université de Bretagne Occidentale, France
Dr Claudia Keitel University of Sydney	Development of a field-based online measurement system for studying the transport and allocation of carbon in plants and soil	Professor Dr Arthur Gessler Leibniz Centre for Agricultural Landscape Research, Germany
Dr George Khairallah University of Melbourne	Gas-phase uni- and bi-molecular studies on metallic and organometallic systems	Professor Jean-Claude Tabet Université Pierre et Marie Curie, France
Dr Travis Klein Queensland University of Technology	Bioprinting of functionalised hydrogels for zonal cartilage tissue engineering	Dr Jos Malda University Medical Centre Utrecht, Netherlands
Dr Jeffrey Leis Australian Museum	Behaviour, ontogeny, dispersal and connectivity in marine fish populations	Dr René Galzin Université de Perpignan, France
Dr Fabio Luciani University of New South Wales	The evolutionary epidemiology of rapidly mutating viruses	Dr Samuel Alizon Génétique et Evolution des Maladies Infectieuses, France
Professor Barbara Messerle University New South Wales	Rational design of bimetallic catalysts for efficient synthesis	Professor Odile Eisenstein Institut Charles Gerhardt, France Professor Stuart Macgregor Heriot-Watt University, UK
Dr Brett Murphy University of Tasmania	Using dynamic global vegetation models to predict the long-term response of northern Australian savannas to fire management and global environmental change	Professor Steven Higgins Goethe University of Frankfurt, Germany
Dr Joanna O'Toole Monash University	Health-based targets for drinking and recycled water guidelines	Dr Ana De Roda Husman National Institute for Public Health and the Environment, Netherlands Professor Gertjan Medema Watercycle Research Institute, Netherlands
Dr Kara Perrow University of Wollongong	Investigating the protective effect of PAI-2 in cancer	Professor Gunilla Hoyer-Hansen Copenhagen University Hospital, Denmark

Australian researcher	Research project	Host
Dr Gianina Ravenscroft University of Western Australia	New frontiers towards improving muscle function for genetic skeletal muscle diseases	Professor Kay Davies University of Oxford, UK Dr Coen Ottenheijm VU University Medical Centre, Netherlands
Dr Jonathan Rhodes University of Queensland	Integrating landscape ecology and landscape genetics for biodiversity conservation	Dr Len Thomas University of St Andrews, UK
Dr Melanie Rug Walter and Eliza Hall Institute of Medical Research	Ultrastructural characterisation of parasite-induced membraneous structures in the malaria-infected red blood cell	Dr Marek Cyrklaff University of Heidelberg, Germany Dr Friedrich Frischknecht University of Heidelberg, Germany
Dr Sebastian Sardina Royal Melbourne Institute of Technology	Approximation techniques for behaviour composition	Professor Giuseppe De Giacomo Sapienza Università di Roma, Italy
Dr Colin Simpfendorfer James Cook University	Developing analytical techniques to study movement and behaviour of acoustically monitored marine organisms	Dr Esben Moland Institute of Marine Research, Norway
Dr Fengwei Xie University of Queensland	Starch-based multilayer nanocomposite materials	Professor Luc Avérous University of Strasbourg, France
Associate Professor Firuz Zare Queensland University of Technology	High intensity ultrasound systems for biomedical and industrial applications	Peter Weber Fraunhofer Institute for Biomedical Technique, Germany

Appendix 4: Scientific visits to North America 2010–11

Recipients of the Australian Academy of Science's scientific visits to North America 2010–11

Australian researcher	Research project	Host
Dr Line Bay James Cook University	Can corals acclimatise and adapt to climate change?	Assistant Professor Mikhail Matz University of Texas, USA
Dr Michael Brown Monash University	The growth of galaxies	Professor Martin White University of California, USA Dr Buell Jannuzi National Optical Astronomy Observatory, USA
Dr Martina Doblin University of Technology Sydney	Assessing phytoplankton connectivity along Australia's east coast to investigate the outcome of a strengthening East Australia Current under climate change	Dr Tatiana Rynearson University of Rhode Island, USA
Dr Catia Domingues CSIRO Marine and Atmospheric Research	Increasing confidence in regional projections of future ocean warming and sea-level rise	Dr Peter Glecker Lawrence Livermore National Laboratory, USA
Dr Anthony Dosseto University of Wollongong	Quantifying past changes in sediment transport to study the response of our environment to climate change	Dr Kate Maher Stanford University, USA
Dr Tim Doyle Royal Melbourne Institute of Technology	Development of a musculoskeletal model to determine the effect of fatigue on injury risk	Dr Eric Dugan Boise State University, USA Dr Jeff Reinbolt University of Tennessee, USA Dr Ajay Seth Stanford University, USA

Australian researcher	Research project	Host
Dr Theodore Evans Deakin University	Invasive termites alter forests and increase greenhouse emissions in the USA	Professor Brian Forschler University of Georgia, USA Dr Alan Lax ARS Southern Regional Research Center, USA Dr Carl Trettin United States Department of Agriculture, USA
Dr Stephanie Feih Royal Melbourne Institute of Technology	Sustainable recycling of glass and carbon fibre composites	Professor Scott Case Virginia Polytechnic Institute and State University, USA
Dr Mark Gibson CSIRO	Determination of the metallic glass forming region via LENS derived composition gradients	Professor Hamish Fraser Ohio State University, USA
Dr Daniel Gomez CSIRO	Surface plasmons and quantum dots: amplified stimulated emission of light	Professor Gregory Hartland University of Notre Dame, USA
Dr Jenny Ho Monash University	Interfacing surface acoustic wave microfluidics atomisation platform with mass spectrometry for molecular biosensing	Professor Hsueh-Chia Chang University of Notre Dame, USA
Dr Bevan Huang CSIRO	Modernising genetic analysis in crops by harnessing the power of graphic processing units	Dr Vijay Pande Stanford University, USA
Dr Andrew Merchant University of Sydney	Developing novel, phloem-based diagnostic tests of plant health and nutrition	Professor Elizabeth Ainsworth University of Illinois, USA Professor Elizabeth Van Volkenburgh University of Washington, USA
Professor Barbara Nowak University of Tasmania	Use of genomics to study parasitic diseases of fish farmed in Australia	Dr Simon Jones Fisheries and Oceans Canada, Canada Professor Ben Koop University of Victoria, Canada
Associate Professor Sebely Pal Curtin University of Technology	Prospective Australian Health Weight Registry (PAWCR)	Professor James Hill University of Colorado, USA
Dr Alistair Poore University of New South Wales	Chemical warfare: using pharmacology to understand herbivore tolerance to plant chemical defences	Assistant Professor Jennifer Forbey Boise State University, USA
Dr Martina Sanderson-Smith University of Wollongong	Elucidation of the role of host-plasminogen activators in invasive group A streptococcal disease	Professor Francis Castellino University of Notre Dame, USA
Dr Dawei Wang University of Technology	Electrochemical reactivity and recognition of oxygen functionalities on thin grapheme oxide nanosheets	Professor Allen Bard University of Texas, USA
Professor Michael Ward University of Sydney	Applications of BioPortal system for infectious disease spread analysis	Dr Andres Perez University of California, USA
Dr Wei Zhang University of New South Wales	Coding for wireless systems with low-complexity receiver	Professor Xiang-Gen Xia University of Delaware, USA

Appendix 5: Scientific visits: China 2010–11

Recipients of the Australian Academy of Science's scientific visits to China 2010–11

Australian researcher	Research project	Host
Dr Zhigang Chen University of Queensland	Development of nanostructured sensors for detection of chemical species	Professor Hui-Ming Cheng Institute of Metal Research, Chinese Academy of Sciences
Dr Yuqing Feng CSIRO	Multi-scale modelling of bubble driven multiphase flow of complex systems	Professor Jinghai Li Institute of Process Engineering, Chinese Academy of Sciences Professor Zhaowen Wang Northwestern University
Professor Robin Gasser University of Melbourne	Unlocking the secrets of pathogen biology using next-generation technologies	Professor Huimin Yan Wuhan Institute of Virology, Chinese Academy of Sciences Professor Xingquan Zhu South China Veterinary Medicine
Dr Youguang Guo University of Technology Sydney	Study on advanced electrical drive for modern transportation vehicles	Professor Yaohua Li Institute of Electrical Engineering, Chinese Academy of Sciences Professor Xuefan Wang Huazhong University of Science and Technology
Dr Alice Hayward University of Queensland	Diversity genomics and epigenetics in brassicas and Chinese medicinal plants	Professor Ying Wang Functional Genomics Laboratory, Chinese Academy of Sciences Professor Jinling Meng Huazhong Agricultural University
Dr Zhen Li University of Queensland	Preparation and bioapplication of multifunctional magnetic nanoparticles	Professor Hao Lei Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences Professor Bien Tan Huazhong University of Science and Technology
Dr Steven Polyak University of Adelaide	New agents for important infectious diseases	Professor Lixin Zhang Institute of Microbiology, Chinese Academy of Sciences Dr Xiaoguang Lei National Institute of Biological Sciences
Dr Di Yu Garvan Institute of Medical Research	MicroRNA-mediated immune regulation in autoimmune diseases	Professor Dr Nan Shen Institute of Health Sciences, Chinese Academy of Sciences Professor Zhanguo Li Peking University
Dr Ji Zhang University of Southern Queensland	Privacy-preserving anomaly detection from distributed data streams	Professor Liusheng Huang University of Science and Technology of China, Chinese Academy of Sciences Professor Yezheng Liu Hefei University of Technology Professor Yonglong Luo Anhui Normal University

Recipients of the Australian Academy of Science's scientific visits from China 2010–11

Chinese researcher	Research project	Australian host researcher
Associate Professor Tao Che Cold and Arid Regions Environment and Engineering Research Institute, Lanzhou	Australian airborne Cal/val experiment for SMOS	Professor Jeffery Walker Monash University
Assistant Professor Xujun Han Cold and Arid Regions Environment and Engineering Research Institute, Lanzhou	Australian airborne Cal/val experiment for SMOS	Professor Jeffery Walker Monash University
Professor Changqing Hu Institute of Acoustics, Shanghai	Research on underwater sound propagation, sea floor mapping	Associate Professor Phillip Mulhearn University of Sydney
Professor Xin Li Cold and Arid Regions Environment and Engineering Research Institute, Lanzhou	Australian airborne Cal/val experiment for SMOS	Professor Jeffery Walker Monash University
Associate Professor Yu Li Institute of Acoustics, Beijing	Research on underwater acoustics communication, underwater acoustics sensor network	Dr David Blair University of Sydney
Dr Licheng Lu Institute of Acoustics, Beijing	Research on very low frequency underwater sound propagation and geoacoustic inversion	Professor Alexander Gavrilov Curtin University of Technology
Qinghai Song Xishuangbanna Tropical Botanic Garden, Yunnan	Functional diversity of carbon gain and water use in dominant trees of a tropical rain forest	Dr Ying-Ping Wang CSIRO Marine and Atmospheric Research
Assistant Professor Liang Wang National Astronomical Observatories of China, Beijing	Extra-solar planet search in the southern hemisphere	Dr Rob Wittenmyer University of New South Wales
Professor Qiuliang Wang Institute of Electrical Engineering, Beijing	HTSC for high magnet superconducting magnet technology for NMR/MRI	Professor Ian Brereton University of Queensland Professor Shixue Dou University of Wollongong
Dr Xuijie Wang Institute of Genetics and Developmental Biology, Beijing	Functional analysis of soybean microRNAs	Professor Mohan Singh University of Melbourne
Associate Professor Yaqing Wang Institute of Genetics and Developmental Biology, Beijing	Novel drug discovery: POSH functions in JNK-pathway and affects cell differentiation and migration during neuron development	Dr Tainhua He University of Western Australia Professor Robert Saint University of Melbourne
Professor Jun Wen Cold and Arid Regions Environment and Engineering Research Institute, Lanzhou	Australian airborne Cal/val experiment for SMOS	Professor Jeffery Walker Monash University
Professor Longhua Wu Institute of Soil Sciences, Nanjing	Distribution and biological mechanisms of zinc and cadmium detoxification by hyperaccumulators	Professor Caixian Tang La Trobe University
Professor Zhiheng Xu Institute of Genetics and Developmental Biology, Beijing	Novel drug discovery: POSH functions in JNK-pathway and affects cell differentiation and migration during neuron development	Dr Tainhua He University of Western Australia Professor Robert Saint University of Melbourne
Professor Juan Zeng Institute of Acoustics, Beijing	Research on bottom acoustical parameter modelling and inversing	Professor Alexander Gavrilov Curtin University of Technology
Professor Yi-ping Zhang Xishuangbanna Tropical Botanical Garden, Yunnan	Carbon dioxide and water exchange in a tropical rain forest and a rubber plantation	Dr Ying-Ping Wang CSIRO Marine and Atmospheric Research

Appendix 6: Scientific visits from Japan 2010–11

Recipients of the Australian Academy of Science's scientific visits from Japan 2010–11

Japanese researcher	Research project	Australian host researcher
Assistant Professor Masamitsu Hoshino Sophia University	Cross sections for understanding low-temperature plasmas: electron scattering and molecular radicals	Professor Michael Brunger Flinders University Professor Steven Bruckman Australian National University
Dr Kikukatsu Ito Crybiofrontier Research Institute	Respiration control in thermogenic plants	Professor Roger Seymour University of Adelaide
Dr Katsuaki Komai Hiroshima University	Study on the material transport and the infiltration/exfiltration effects on the turbulent boundary layer on water-bottom interface	Dr Peter Neilsen University of Queensland
Professor Jun Tanimoto Kyushu University	A challenge applying evolutionary game theory to analysis for traffic congestion that can be observed as a macro phenomenon of multi granular dynamical system	Professor Hussein Abbass University of New South Wales

Appendix 7: Scientific visits: Korea 2010–11

Recipients of the Australian Academy of Science's scientific visits to Korea 2010–11

Australian researcher	Research project	Host
Dr Muthuraaman Bhagavathi Achari Queensland University of Technology	New nanocomposite polymer electrolyte system for durable dye-sensitised solar cells	Professor Kim Jaekook Chonnam National University
Associate Professor Warrick Lawson University of New South Wales	Fundamental stellar properties of pre-main sequence stars	Dr A-Ran Lyo Korea Astronomy and Space Science Institute
Dr Yutaek Seo CSIRO	Fundamental study on hydrate kinetics and development of inhibitor screening strategy	Professor Huen Lee Korea Advanced Institute of Science and Technology

Recipients of the Australian Academy of Science's scientific visits from Korea 2010–11

Korean researcher	Research project	Australian host researcher
Jung Kim Mokwon University	Study on breakthrough for non-deterministic lightweight protocols for security and privacy in RFID environments	Professor Colin Boyd Queensland University of Technology
Professor Dr Kyungrock Paik Korea University	Coupling stochastically generated rainfall fields with deterministic landform evolution modelling	Associate Professor Ashish Sharma University of New South Wales
Professor Dr Koo Shin University of Sejong	Conducting polymers, nanocomposite materials, graphene	Professor Wojteck Wlodarski RMIT University

Appendix 8: Scientific visits to Taiwan 2010–11

Recipients of the Australian Academy of Science's scientific visits to Taiwan 2010–11

Australian researcher	Research project	Host
Dr Thiruma Arumugam University of Queensland	Role of adiponectin receptors in ischaemic stroke induced brain injury	Dr Sung-Chun Tang National Taiwan University
Professor Alexander Babanin Swinburne University of Technology	Giant waves, theoretical and experimental modelling	Professor Hwung-Hweng Hwung National Cheng Kung University
Dr Chris Burridge University of Tasmania	Genetic variation in the Indo-Pacific fish genus *Acanthopagrus*	Professor Jin-Chywan Gwo National Taiwan Ocean University
Dr Ralf Dietzgen Queensland Department of Employment, Economic Development and Innovation	Recombinant rhabdovirus expression system to study host-virus interactions	Associate Professor Chi-Wei Tsai Taiwan National University
Dr Hung-Yao Hsu University of South Australia	Development of a novel automatic hybridisation station with in situ optical monitoring for DNA microarray technology	Professor Liang-Chia Chen National Taipei University of Technology
Associate Professor Lingxue Kong Deakin University	Nanocharacterisation of membrane materials for desalination	Professor Allan Kuo-Lun Tung Chung Yuan Christian University
Dr Lisa Lee University of New South Wales	Strengthening regional border policies to restrict illegal wildlife trade	Professor Kurtis Jai-Chyi Pei National Pingtung University of Science and Technology
Dr John Thomas Queensland Department of Employment, Economic Development and Innovation	Establishment of collaborative research on the diagnosis and control of begomoviruses and tospoviruses	Dr Lawrence Kenyon Asian Vegetable Research and Development Center
Professor Xiaolin Wang University of Wollongong	Study of the electron spin states in newly discovered transition metal compounds	Professor Jin-Ming Chen National Synchrotron Radiation Research Center Professor Run-Shi Liu National Taiwan University
Dr Guanglu Zhou Curtin University of Technology	Robust methods for nonlinear matrix optimisation with applications in engineering and business	Professor Soon-Yi Wu National Cheng Kung University

Appendix 9: COST exchanges 2010–11

Australian researcher	Research project	Host researcher
Professor Janice Aldrich-Wright University of Western Sydney	**COST Action D39**: Metallo-Drug Design and Action	Dr Zoe Pikramenou University of Birmingham, UK
Dr Marie-liesse Asselin-Labat Walter and Eliza Hall Institute	**COST Action BM0703**: Cancer and Control of Genomic Integrity (CANGENIN)	Dr Jos Jonkers Professor Anton Berns The Netherland Cancer Institute, Netherlands
Associate Professor Stephen Barrass University of Canberra	**COST Action IC0601**: Sonic Interaction Design (SID)	Dr Dian Whitmer Starlab Barcelona SL, Spain
Associate Professor Gerd Bossinger University of Melbourne	**COST Action FP0905**: Biosafety of Forest Transgenic Trees: Improving the Scientific Basis for Safe Tree Development and Implementation of EU Policy Directives	Dr Matthias Flauding University of Hamburg, Germany Professor Fernando Gallardo Universidad de Malaga, Spain
Dr Andrew Bowie University of Tasmania	**COST Action ES0801**: The Ocean Chemistry of Bioactive Trace Elements and Paleoclimate Proxies	Dr Maeve Lohan University of Plymouth, UK
Professor Lex Brown Griffith University	**COST Action TD0804**: Soundscape of European Cities and Landscapes	Professor Jian Kang Sheffield University, UK

Australian researcher	Research project	Host researcher
Mark Brown University of Melbourne	**COST Action FP0902**: Development and Harmonisation of New Operational Research and Assessment Procedures for Sustainable Forest Biomass Supply	Dominik Roser Finnish Forest Research Institute, Finland Professor Raffaele Spinelli CNR, Italy Dr Karl Stampfer University of Natural Resources and Applied Life Sciences, Austria
Professor Michael Brunger Flinders University	**COST Action CM0601**: Electron Controlled Chemical Lithography (ECCL)	Professor Dr Oddur Ingolfsson Science Institute, University of Iceland
Professor Stephen Buckman Australian National University	**COST Action CM0601**: Electron Controlled Chemical Lithography (ECCL)	Professor Gustavo Garcia Instituto de Fisica Fundamental, Spain
Dr Naveen Chilamkurti La Trobe University	**COST Action IC0906**: WiNeMO – Wireless Networking for Moving Objects	Professor Yevgeni Koucheryavy Tampere University of Technology, Finland
David Coote University of Melbourne	**COST Action FP0902**: Development and Harmonisation of New Operational Research and Assessment Procedures for Sustainable Forest Biomass Supply	Dr Sari Pitkanen University of Eastern Finland, Finland
Professor Donna Cross Edith Cowan University	**COST Action IS0801**: Cyberbullying: Coping with Negative and Enhancing Positive Uses of New Technologies, in Relationships in Educational Settings	Dr Peter Smith Cranfield University, UK Professor Geriges Steffgen University of Luxembourg, Luxembourg
Professor Carey Curtis Curtin University of Technology	**COST Action TU1002**: Accessibility Instruments For Planning Practice In Europe	Dr Cecilia Silva Oporto University, Portugal
Dr Katherine Daniell Australian National University	**COST Action IC0602**: Algorithmic Decision Theory	Professor Dr Alexis Tsoukias Université Paris-Daphine, France
Dr Vincent Daria Australian National University	**COST Action MP0604**: Optical Micro-Manipulation by Nonlinear Nanophotonics	Professor Jesper Gluckstad Technological University of Denmark, Denmark
Professor John Davy RMIT University	**COST Action FP0702**: Net-Acoustics for Timber-based Lightweight Buildings and Elements	Dr Jonas Brunskog Danish Technological University, Denmark Bart Ingelaere Belgian Building Research Institute, Belgium Birgit Rasmussen Aalborg University, Denmark
Associate Professor Colin Duffield University of Melbourne	**COST Action TU1001**: P3T3 – Public Private Partnerships in Transport: Trends and Theory	Professor Rosario Macario Lisbon Technical University, Portugal
Dr Alexander Fuerbach Macquarie University	**COST Action MP0702**: Towards Functional Sub-Wavelength Photonic Structures	Professor Andrius Baltuska Vienna University of Technology, Austria
Rachel Hampton-Smith University of Adelaide	**COST Action TD0901**: Hypoxia Sensing, Signalling and Adaptation	Professor Dr Ian Frew Professor Roland Wenger University of Zurich, Switzerland Professor Dr Doerthe Katschinski Georg-August-Universität, Germany Professor Dr Lorenz Poellinger Karolinska Institutet, Sweden
Salil Kanhere University of New South Wales	**COST Action IC0906**: WiNeMO – Wireless Networking for Moving Objects	Professor Torsten Braun University of Berne, Switzerland

Australian researcher	Research project	Host researcher
Dr Malcolm Knox CSIRO Livestock Industries	**COST Action FA0805**: Goat-parasite interactions: from knowledge to control (CAPARA)	Dr Marian Varady Slovakia Academy of Sciences, Slovakia
Professor Ryszard Kowalczyk Swinburne University of Technology	**COST Action IC0801**: Agreement Technologies	Professor Sascha Ossowski University of Ray Juan Carlos, Spain
Professor David McNeil University of Tasmania	**COST Action 873**: Bacterial Diseases of Stone Fruits and Nuts	Dr Brion Duffy Agroscope FAW Wadenswil, Switzerland
Associate Professor Gregory Metha University of Adelaide	**COST Action D41**: Inorganic Oxides: Surfaces and Interfaces	Professor Ulruch Heiz Technical University of Munich, Germany
Professor Grant Morahan University of Western Australia	**COST Action BM0901**: European systems genetics network for the study of complex genetic human diseases using mouse genetic reference populations (SYSGENET)	Dr Richard Mott Oxford University, UK Professor Klaus Schughart Helmholtz Centre of Infection Research, Germany
Jennifer Morrow University of Western Sydney	**COST Action FA0701**: Arthropod Symbiosis: From Fundamental Studies to Pest and Disease Management	Dr Lisa Klasson Uppsala University, Sweden Associate Professor Wolfgang Miller Medical University of Vienna, Austria
Professor Karlheinz Peter Baker IDI Heart and Diabetes Institute	**COST Action BM0702**: Urine and Kidney Proteomics	Professor Dr Constantinos Deltas University of Cyprus
Professor Alan Petersen Monash University	**COST Action IS1001**: Bio-objects and their Boundaries: Governing Matters at the Intersection of Society, Politics, and Science	Professor Stephen Wainwright King's College London, UK
Dr Adam Polkinghorne Queensland University of Technology	**COST Action 867**: Welfare of Fish in European Aquaculture	Dr Gilbert Greub University of Lausanne, Switzerland Dr Helmut Segner University of Bern, Switzerland Dr Lloyd Vaughan University of Zurich, Switzerland
Dr John Runcie University of Sydney	**COST Action ES0906**: Seagrass Productivity: From Genes to Ecosystem Management	Dr Rui Santos University of Algarve, Portugal
Associate Professor Sergey Shabala University of Tasmania	**COST Action FA0901**: Putting Halophytes to Work – From Genes to Ecosystems	Professor Tim Flowers University of Sussex, UK Professor Sven-Eric Jacobsen University of Copenhagen, Denmark
Dr Yan Sheng Australian National University	**COST Action MP0702**: Towards Functional Sub-Wavelength Photonic Structures	Dr Kaloian Koynov Max Planck Institute for Polymer Research, Germany
Professor Phillip Slee Flinders University	**COST Action IS0801**: Cyberbullying: Coping with Negative and Enhancing Positive Uses of New Technologies, in Relationships in Educational Settings	Dr Peter Smith Cranfield University, UK Professor Gerges Steffgen University of Luxembourg, Luxembourg
Dr Barbara Spears University of South Australia	**COST Action IS0801**: Cyberbullying: Coping with Negative and Enhancing Positive Uses of New Technologies, in Relationships in Educational Settings	Dr Peter Smith Cranfield University, UK
Dr Amanda Spurdle Queensland Institute of Medical Research	**COST Action BM0606**: Collaborative Association Studies in Breast Cancer	Professor Douglas Easton University of Cambridge, UK Dr Per Hall Karolinksa Institute, Sweden
Professor Roger Stone University of Southern Queensland	Food and Agriculture Domain: COST Annual Progress Conference	None

Australian researcher	Research project	Host researcher
Professor Peter Stopher University of Sydney	**COST Action TU0804**: Survey Harmonisation with New Technologies Improvement (SHANTI)	Jimmy Armoogum INRETS, France
Professor Michael Wagner University of Canberra	**COST Action 2101**: Biometrics for Identity Documents and Smart Cards	Dr Andrzej Drygajlo Swiss Federal Institute of Technology, Switzerland
Sarah Wilkins University of Adelaide	**COST Action TD0901**: Hypoxia Sensing, Signalling and Adaptation	Professor Dr Ian Frew Professor Ronald Wenger University of Zurich, Switzerland
Dr Ryan Wilkinson University of Tasmania	**COST Action 867**: Welfare of Fish in European Aquaculture	Dr Morris Robinson Polytechnic University of Madrid, Spain
Dr Jianming Yong University of Southern Queensland	**COST Action IC0806**: Intelligent Monitoring, Control and Security of Critical Infrastructure	Professor Xavi Masip Bruin Technical University of Catalonia, Spain

Appendix 10: European Union International Research Staff Exchange Scheme

Group research leader	Research project	Host
Professor Tim Bedding University of Sydney	**ASK**: Sounding Stars with Kepler	Dr Joanna Molenda-Żakowicz Wroclawski University, Poland
Professor Edward Chung Queensland University of Technology	**OPTIMUM**: Optimised ITS-based Tools for Intelligent Urban Mobility	Nour-eddin El Faouzi INRETS, France
Professor Michael French CSIRO Food and Nutritional Sciences	**MICROGENNET**: Building a Micronutrient Genomics Network for improving the knowledge base of micronutrient genomics	Dr Susan Douthie University of Aberdeen, UK
Professor Paul Haddad University of Tasmania	**MASK**: Materials and Advances Sensor Knowledge Exchange	Professor Dermot Diamont Dublin City University, Ireland
Professor Richard Krever Monash University	**ITC**: International Tax Co-ordination	Professor Michael Lang Vienna University, Austria
Professor Douglas MacFarlane Monash University	**MASK**: Materials and Advances Sensor Knowledge Exchange	Professor Dermot Diamont Dublin City University, Ireland
Professor Philip Marriott Monash University	**ELECTROACROSS**: Electrokinetics across disciplines and continents: an integrated approach to finding new strategies to sustainable development	Professor Alexandra de Jesus Branco Ribeiro New University of Lisbon, Portugal
Dr Maximilian Ott NICTA	**CoopLab**: A federated testbed environment for experimentation on wireless cooperative networks	Professor Leandros Tassiulas University of Thessaly, Greece
Professor Reinout Quispel La Trobe University	**CRiSP**: Collaborative Research in Structure Preservation	Professor Elena Celledoni Norwegian University of Science and Technology, Norway
Professor Gordon Wallace University of Wollongong	**MASK**: Materials and Advances Sensor Knowledge Exchange	Professor Dermot Diamont Dublin City University, Ireland
Professor Graeme Young Flinders University of South Australia	**MICROGENNET**: Selenium, Selenoproteins and colon cancer risk: analysis of polymorphisms and gene expression in selenoproteins in human biopsies	Professor John Hesketh Newcastle University, UK
Dr Peter Zalewski University of Adelaide	**MICROGENNET**: Extension, enhancement and strengthening of established collaborations for the purpose of community-driven knowledge base for micronutrient genomics	Dr Guiditta Perozzi National Research Institute on Food and Nutrition, Italy

Appendix 11: Australia–Germany funding 2010–11

Researcher mobility

Lead Australian Project Manager	Research project	Lead German Project Manager
Dr Michael Higgins University of Wollongong	Organic nanoelectrode probes for neural interfacing applications	Dr Christine Kranz University of Ulm
Associate Professor Alan Chaffee Monash University	Chemically modified diodic membranes for carbon dioxide separation	Professor Dr Jorg Thoming University of Bremen
Professor Nicolas Voelcker Flinders University	Nanostructured surface-bound gradients for high-throughput screening of stem cell-surface interactions	Professor Michael Veith Liebniz Institute for New Materials
Dr David Jones University of Melbourne	Printed polymer electrodes for applications in flexible electronics	Dr Alexander Colsmann Karlsruhe Institute of Technology
Dr Klaus Meiners University of Tasmania	The importance of sea ice for winter-survival of Antarctic krill: a keystone species in Southern Ocean ecosystems	Dr Bettina Meyer Alfred Wegener Institute for Polar and Marine Science
Dr Jurg Schutz CSIRO	Boron nitrite nanocrystalline films and nanostructures for application in high performance devices	Dr Sven Meier Fraunhofer Institute
Dr Dragomir Neshev Australian National University	Signal processing in quadratic nonlinear waveguides	Professor Thomas Pertsch Friedrich Schiller University
Professor Manfred Lenzen University of Sydney	From centres of consumption to environmental hot spots: how international trade facilitates pressure on water and resources	Professor Joachim Von Braun Universität Bonn
Associate Professor Elanor Huntington University of New South Wales	Towards coherent control of quantum information and communication systems	Dr Michele Heurs Gottfried Wilhelm Leibniz Universität
Professor Colin Boyd Queensland University of Technology	Privacy in online communications	Professor Mark Manulis Technische Universitaet Darmstadt
Dr Phil Schneider James Cook University	Development of process models and advisory tools for the design of full-scale nutrient recovery systems	Herr Edgar Mohn Abwasserzweckverband Raum Offenburg
Dr Caroline Ummenhofer University of New South Wales	Characteristics and evolution of Indian Ocean dipole events in high-resolution ocean model simulants	Professor Claus Boening Liebniz Institut für Meereswissenschaften an der Universität Kiel
Dr Herbert Volk CSIRO	Alteration of organic composition of palynomorphs during diagenesis and their oil-generating potential	Professor Ralf Littke Aachen University
Dr Jorg Hacker Flinders University of South Australia	Aerosol production from Australian salt ecosystems	Dr Wolfgang Junkermann Karlsruhe Institute of Technology

Solar photovoltaics research funding

Lead Australian Project Manager	Research project	Lead German Project Manager
Professor Paul Mulvaney University of Melbourne	Scaleable interdigitation arrays for solar photovoltaics	Professor Michael Giersig Frei University
Professor Paul Burn University of Queensland	The use of triplet states to enhance the efficiency of next generation solar cells	Professor Uli Lemmer Light Technology Institute
Dr Wallace Wong University of Melbourne	Advanced materials for organic photovoltaics	Professor Dr Peter Bauerle University of Ulm
Professor Leone Spicca Monash University	Solar driven water splitting technologies	Dr Klaus Lips Helmholtz Centre Berlin

Lead Australian Project Manager	Research project	Lead German Project Manager
Dr Udo Bach Monash University	Dye sensitised solar cells and new hybrid thin film technologies	Professor Lukas Schmidt-Mende Ludwig-Maximillians-Universitat München
Professor Paul Dastoor University of Newcastle	Mass-printing of organic solar cells using novel water-based function materials	Professor Arved Hubler Chemnitz University of Technology
Ivan Perez-Wurfl University of New South Wales	Silicon quantum dots and silver nano particles evaluated by SNOM, AFM, PDS, and time of flight for application of third generation solar cells	Professor Heinrich Kurz Rheinisch-Westfalische Technische Hochschule
Professor Janusz Nowotny University of Western Sydney	Photosensitive oxide semiconductors for solar fuel	Professor Sebastian Fiechter Helmholtz-Zentrum Berlin für Materialien und Energie

Appendix 12: Japan Society for the Promotion of Science Postdoctoral Fellowships 2010–11

Australian researcher	Research project	Host
Dr Matthew Addicoat Australian National University	First principles DFT and self-consistent-charge density-functional tight-binding studies of ionic liquid interactions with highly polarisable surfaces	Associate Professor Stephan Irle Nagoya University
Dr Anna Barron University of Southern California	Neurosteroid hormones in ageing and disease: potential therapeutic targets for the management of Alzheimer's disease	Professor Suguru Kawato University of Tokyo
Dr Brett Johnson University of Melbourne	Radiation effects in wide band-gap semiconductors	Dr Takeshi Ohshima Japan Atomic Energy Agency
Gemma Kirwan RMIT University	Bioinformatic and systems biology approaches for etiology of disease pathology	Associate Professor Susumu Goto Kyoto University
Dr Paul Otsuka Hokkaido University	Ultrafast acoustic modulation of nanostructures supporting surface plasmon polaritions	Professor Oliver Wright Hokkaido University
Dr Sabina Quader Griffith University	Design, synthesis and biological evaluation of E-Selectin targeted drug delivery system using poly(ehthlene glycol)-poly(amino acid) (PEG-PAA) block copolymer micelles for cancer therapy	Professor Kazunori Kataoka University of Tokyo
Alejandro Reyes James Cook University	The cellular mechanisms regulating cell differentiation and toti/pluripotency in reef-building corals	Professor Michio Hidaka University of the Ryukyus
Dr Simon Song University of Queensland	Sexual selection and genital evolution in Ohomopterus ground beetles (Coleoptera: Carabidae)	Professor Teiji Sota Kyoto University
Dr Duncan Sutherland John Curtin School of Medical Research	Evaluating the role of Toll-like receptors and commensal bacteria in the preferential generation of B Helper T (TFH) Cells from Foxp3+ T cells in Gut Peyer's Patches	Dr Sidonia Fagarasan RIKEN
Dr James Worth University of Tasmania	Conservation genetics of the Japanese endemic conifer *Sciadopitys verticillata* utilising a whole chloroplast genome approach	Professor Yuji Isagi Kyoto University
Dr Honglei Xu Curtin University of Technology	Stability analysis and optimal control of stochastic impulsive systems	Professor Masao Fukushima Kyoto University
Dr Qiwen Yao University of Wollongong	Development of novel environmental friendly lead-free ferroelectric materials	Dr Hideo Kimura National Institute of Materials Science

Appendix 13: Japan Society for the Promotion of Science Short-term Invitational Fellowships 2010–11

Australian researcher	Research project	Host
Professor Stephen Buckman Australian National University	Low energy lepton interactions – applications of electrons and positrons in technology and biomedical science	Professor Jiroshi Tanaka Sophia University
Dr Tamim Darwish ANSTO	Efficient utilisation of deuterated molecules in biophysics study with sum frequency generation (SFG) vibration spectroscopy and neutron scattering techniques	Associate Professor Shen Ye Hokkaido University
Associate Professor Kevin Downard University of Sydney	Application of quadropole-ion mobility-time of flight (Q-IM-ToF) mass spectrometry to study impact of oxidation on stability and integrity of protein complexes important to human vision	Associate Professor Satoko Akashi Yokohama City University
Associate Professor Richard Lai La Trobe University	Building quality software system using a component-based software technology framework	Professor Shaoying Lai Hosei University
Professor Andrew McMinn University of Tasmania	Monitoring the effects of climate change on sea ice covered areas of the Southern Ocean, off eastern Antarctica	Dr Kentaro Watanabe National Institute of Polar Research
Associate Professor Anna Roujeinikova Monash University	Towards understanding survival mechanisms of medically important bacteria	Professor Keiichi Namba Osaka University
Dr Abd-Krim Seghouane National ICT Australia	Information measures for brain connectivity	Professor Shun-ichi Amari RIKEN Brain Science Institute
Dr Jian Tu Macquarie University	The discovery of biomarker for predicting stroke	Professor Itsu Sen Waseda University

Appendix 14: Japan Society for the Promotion of Science Long-term Invitational Fellowships

Australian researcher	Research project	Host
Dr Ashraf Ghanem University of Tasmania	Flash chemistry: integrated fast enantioselective lipases/metal-catalysis and liquid chromatographic chiral analysis in an in line miniaturised capillary column reaction liquid chromatography for drug discovery and monitoring interconversion in biological fluids	Professor Tohru Ikegami Kyoto Institute of Technology

Appendix 15: 2010 US Summer Program in Australia

Researcher	Host	Research project
Scott Baalrud University of Wisconsin-Madison	A/Professor Christine Charles Australian National University	Current-free double layers for spacecraft propulsion
Suzanne D'Addio Princeton University	Professor Hak-kim Chan University of Sydney	Enhanced delivery of anti-tubercular nanoscale drug cocktails through aerosol formulation
Wanda Eugene Auburn University	A/Professor Andy Dong University of Sydney	Culture-based Education Technology for Indigenous Australian (CETIA) project
Brian Gray University of California, Riverside	Professor Leigh Simmons University of Western Australia	Perception of sperm competition risk and male investment in reproduction: can acoustic signals alter the perceived risk of sperm competition in Pacific field crickets?
Amanda Grill South Dakota School of Mines and Technology	Dr Victoria Haritos, Dr Andrew Warden and Greg Dojchiniov CSIRO Entomology	Stability and activity of enzyme-functionalised surfaces for biological degradation of biomass
Kyle Handley University of Maryland – College Park	A/Professor Donald Maclaren University of Melbourne	Exporting under trade policy uncertainty: theory and evidence from Australia
Alexander Hill University of Wisconsin at Madison	Dr Bryan Gaensler University of Sydney	The magnetised multi-phase interstellar medium
Lily House-Peters University of Arizona	Professor Rebekah Brown and Professor Nigel Tapper Monash University	Examining barriers to realising water-sensitive urban design: the challenge of institutionalising alternative water technologies in spite of long-term drought and conservation education
Cory Krediet University of Florida	Dr David Bourne Australian Institute of Marine Science	Use of stable fluorescent-tagged *Vibrio coralliliyticus* strains to investigate bacterial-coral host infections and coral disease infection processes
Noah Kuntz Drexel University	Professor Hugh Durrant-Whyte and Dr James Underwood University of Sydney	Evaluation system for segmentation of 3D LIDAR data
Christopher Laumer Harvard University	Dr Nicholas Murphy La Trobe University	Taxonomy and phylogeny of *Australasian Prorhynchidae*
Michelle Mo Yale University	Dr Brett Graham University of Newcastle	Determining the role of chromogranin B in neutral calcium signalling
Samuel Papendick South Dakota School of Mines and Technology	Professor Victor Rudolph, Dr Sue Golding and Dr Paul Massarotto University of Queensland	Microbial enhancement of coal-bed methane
Rory Polera University of New Carolina at Chapel Hill	A/Professor Cynthia Joll Curtin University of Technology	Fluorescent fingerprinting of dissolved organic matter as a monitoring tool in reclaimed water
Erin Poth Johns Hopkins University	Professor John Mattick University of Queensland	Identification of functionally important domains and biochemical targets of long non-coding RNAs prominently expressed in the developing mouse nervous system
Kristen Rathjen University of Maryland	Dr Kylie Pitt Griffith University	Effects of ocean warming and acidification on population dynamics and statolith formation of early life history stages of cubosoan jellyfish
Steven Saville Clemson University	Professor Tim St Pierre and A/Professor Mike House University of Western Australia	NMR investigation of iron oxide nanoparticles for use as MRI contrast enhancement agents

Researcher	Host	Research project
Ian Stephens University of Illinois	Dr Maxim Voronkov CSIRO Australia Telescope National Facility	Using the ATCA and ATNF to probe the evolution of LMC massive star formation
Caroline Titcomb University of Alabama	Professor Jane Goodman-Delahunty Charles Sturt University and Australian Graduate School of Policing	Risk of intrafamilial sex offending among biological and non-biological fathers: does biology matter?
Holly Noelle Woodward Ballard Montana State University	Dr Thomas Rich Museum Victoria	Using osteohistology to gain further insights into the growth, physiology and behaviour of the high latitude hypsilophodontids from Victoria, Australia

Appendix 16: List of printed and online publications

Publication	Month	Link
2010		
Annual Report 2009–10	April	science.org.au/reports/2010anrep.html
2010 Public lecture series transcripts		
Water reform in Australia – Ken Matthews	April	science.org.au/events/publiclectures/
Recycling stormwater – new urban water supplies using aquifer recharge – Dr Peter Dillon	June	
Aboriginal knowledge and cultural values of water – Brad Moggridge	September	
Groundwater challenges and opportunities for Australia in the 21st century – Professor Craig Simmons	November	
Australian water reform – the Murray-Darling Basin plan – Professor Barry Hart	December	
Non-series lectures transcript		
Cooperation for a green, smart and sustainable future in the changing world – Professor Yongxiang Lu	November	science.org.au/events/lectures-and-speeches/yongxiang.html
Historical Records of Australian Science vol 21 no 1	June	www.publish.csiro.au/?nid=108
Australia–Indonesia agriculture and food security workshop	June	science.org.au/events/conferences-and-workshops/australiaindonesia10/index.html
Newsletter 80, 81, 82 and *Fenner tribute* brochure	June, September, December	science.org.au/publications/newsletters/index.html
ECR Newsletter No 4 and 5	August, November	science.org.au/ecr/ecr-newsletters/
The science of climate change – questions and answers	August	science.org.au/publications/research-projects-and-policy.html
President's Note 66	August	science.org.au/presnotes
2010 UK–Australia Frontiers of Science marine science meeting proceedings	October	
Australia–China Symposium on agriculture and food security relating to health	November	science.org.au/events/conferences-and-workshops/australiachina/2010/program.pdf
Evaluation of the Science by Doing Stage one Professional Learning Approach 2010 – LJ Rennie	November	science.org.au/sciencebydoing/research-evaluation/
Historical Records of Australian Science vol 21 no 2	December	www.publish.csiro.au/?nid=108
Theo Murphy (Australia) High Flyers Think Tank – *Searching the deep Earth: the future of Australian resource discovery and utilisation*	December	science.org.au/publications/conference-procedings.html
To live within Earth's limits – an Australian plan to develop a science of the whole Earth system	December	science.org.au/natcoms/nc-ess.html

Publication	Month	Link
Australian Academy of Science – *Directory 2010–11*	December	
Success stories of the international science linkages (ISL) – science academies program	December	science.org.au/internat/
2011		
Newsletter 83	March	science.org.au/publications/newsletters/index.html
2010 East Asia and Pacific Summer Institutes – summer program in Australia for US graduate students in science and engineering	March	
2011 Public lecture series transcripts and video recordings		science.org.au/events/publiclectures/
Fenner tribute symposium – Professor Peter Doherty, Emeritus Professor Henry Nix, Professor Adrian Gibbs	February	
Bioterrorism: who do we need to fear the most, the terrorist or the research scientist? – Professor Ian Ramshaw	March	

Appendix 17: Events held at the Shine Dome

Date	Function	Organisation
2010		
6 April	Public lecture: Ken Matthews, *Water reform in Australia*	Australian Academy of Science (AAS)
7–9 April	*Science by Doing* workshop	AAS
15 April	2010 Think Tank committee meeting	AAS
16 April	CCSQA meeting	CCSQA
4–7 May	Science at the Shine Dome	AAS
13 May	Department of Foreign Affairs and Trade meeting	AAS
16 May	Conference about Prophet Hood	Bluestar Agricultural Centre
18–19 May	Managing knowledge for Australia landscapes	Australian River Restoration Centre
26 May	GRACE	ANU
27 May	Dining club	AAS
27 May	Human Frontier Science program	NHMRC
1 June	Public lecture: Peter Dillon, *Recycling stormwater, new urban water supplies using aquifer recharge*	AAS
2 June	CIT architectural design students	Canberra Institute of Technology
3 June	National committees event	AAS
7 June	COST/JSTCC meeting	AAS
8–9 June	Australia–Indonesia agriculture and food security workshop	AAS
10 June	National committees event	AAS
15 June	EAPSI orientation	AAS
16 June	EXCOM meeting	AAS
16 June	New councillors' dinner	AAS
17 June	Council meeting	AAS
21 June	National committees event	AAS
23–24 June	Healthy climate, planet and people	National Centre of Epidemiology and Population Health Fenner Conference
29 June	House Committee meeting	AAS
29 June	Science writing – staff training	AAS
1 July	Wilkhahn product night	Wilkhahn Asia Pacific
5–9 July	56th Scientific and Annual General Meeting of the Australian Mammal Society	Australian Mammal Society

Date	Function	Organisation
6 July	Public lecture: Adjunct Professor Leith Boully, *The water dance*	AAS
13–15 July	Symposium on IT and Indigenous communities	Australian Institute of Aboriginal and Torres Strait Islander Studies
20 July	*Interviews with Australian scientists*	AAS
22 July	EXCOM meeting	AAS
27 July	Corporate Services divisional meeting	Department of Agriculture, Fisheries and Forestry
28 July	Developing a more evidence-based mental health system	NHMRC
29 July	Dining club	AAS
29 July	Staff meeting	NHMRC
3 August	Public lecture: Professor Lin Crase, *The spin and economics of irrigation infrastructure policy in Australia*	AAS
4 August	*Primary Connections* master facilitator leadership training	AAS
5–8 and 12–14 August	Australian Science Festival	Australian Science Festival (ASF)
10 August	Breakfast event with Australian Science Festival	ASF and AAS
16 August	Climate change report launch	DCCEE and AAS
19–20 August	Think Tank 2010	AAS
24 August	2010 LASP Steering Committee meeting	AAS
26 August	Filming of SBS documentary	Joined Up Films
27 August	RIB/RGMS workshop	NHMRC
31 August	Strategy Forum meeting	NHMRC
2, 9, 16, 23, 30 August	GRP briefing session	NHMRC
6 September	National committees event	AAS
6 September	NHMRC event	NHMRC
6–7 September	TPA forum	Australian Competition and Consumer Commission
7 September	Public lecture: Bradley Moggridge, *Aboriginal knowledge and cultural values of water*	AAS
8–9 September	Meat and Livestock forum and meeting	Meat and Livestock Australia
22 September	National Committee Chairs meeting	AAS
23 September	EXCOM / Council meetings	AAS
25 September	Shine Dome open day	AAS
28–29 September	Murray-Darling Basin meeting	Murray-Darling Basin Authority
30 September	Dining club	AAS
1 October	Workshop on public engagement in enabling technologies	DIISR
5 October	Public lecture: Ross Young, *The changing face of the urban water industry in the context of cities of the future*	AAS
5 October	President's briefing to Sectional Committee chairs	AAS
7–8 October	ARC Centre of Excellence symposium	ARC Centre of Excellence for Coral Reef Studies
14 October	*Science by Doing* school coordinators workshop 2	AAS
28 October	Finance Committee meeting	AAS
28 October	Council meeting	AAS
2 November	Public lecture: Professor Craig T Simmons, *Groundwater challenges and opportunities for Australia in the 21st century*	AAS
4 November	*Interviews with Australian scientists*	AAS
4 November	Library Committee meeting	AAS
8 November	House Committee meeting	AAS

Date	Function	Organisation
9–10 November	Academy of the Social Sciences in Australia annual symposium	ASSA
11–12 November	10th Meeting of the ICSU Regional Committee for Asia and the Pacific	AAS
15 November	National committees event	AAS
18 November	Professor Lu lecture and dinner	AAS
22–25 November	International Symposium on Analysis and Detection of Explosives	Australian Federal Police
28 November – 1 December	Boden conference	Queensland Institute of Medical Research
2 December	EXCOM meeting	AAS
2 December	Council meeting	AAS
2 December	Dining club	AAS
7 December	Public lecture: Dr John Passioura FAA, *Water as a limiting resource in dryland agriculture*	AAS
8–10 December	National committees event	AAS
15 December	Excellence Awards dinner	NHMRC
21 December	Meeting with President of Academy of Science of Mongolia	AAS
2011		
11 January	National Youth Science forum (NYSF)	NYSF
17–19 January	Department of Innovation, Industry, Science and Research event	DIISR
17 January	National Mathematics Summer School	National Mathematics Summer School
26 January	National Youth Science forum	NYSF
31 January	Sir Anthony Kelly Lecture	ANU
1 February	Public lecture: Professor Peter Doherty, Emeritus Professor Henry Nix, Professor Adrian Gibbs, *Frank Fenner tribute symposium*	AAS
2 February	EXCOM meeting	AAS
3 February	Council meeting	AAS
10 February	National committees event	AAS
15 February	House Committee meeting	AAS
17 February	*Interviews with Australian scientists*	AAS
24 February	*Science by Doing* school science workshop	AAS
24 February	Dining club	AAS
24 February	Department of Climate Change event	DCCEE
1 March	Public lecture: Professor Ian Ramshaw, *Bioterrorism, who do we need to fear most, the terrorist or the research scientist?*	AAS
2 March	EXCOM meeting	AAS
3–4 March	Council meeting	AAS
10 March	Branch meeting	DCCEE
16 March	International workshop	AAS
17 March	Murray-Darling Basin Authority event	Murray-Darling Basin Authority
22 March	Reducing Emissions from Livestock Research program	Meat and Livestock Australia
23 March	Australia–China Phenomics Group presentation	DIISR and Department of the Prime Minister and Cabinet
24–25 March	ASSA forum	ASSA

Appendix 18: Support for Academy activities

(Amounts of $1,000 and above are acknowledged)

Recent benefactors of the Academy

Donations

Donor	Purpose	Date	Amount $
Thomas Lewis Davies Estate	Thomas Lewis Davies Endowment Fund	May 2010	3,000,000
Margaret Middleton	Margaret Middleton Fund for endangered Australian vertebrate animals	June 2010	60,000
Heyde Family	Christopher Charles Heyde Fund	June 2010	150,000
The Selby Scientific Foundation	Selby Fellowship Fund	October 2010	8,500
Anonymous	WH Gladstones Population and Environment Fund	October 2010	5,000
Australian Antarctic Division	Contribution to the International subscription	December 2010	9,774
Estate of Phillip Garth Law	Phillip Garth Law Fund	March 2011	20,000
Rod Rickards Fellowship	Rod Rickards Fellowship Fund	March 2011	15,000
Anonymous	Fellows Endowment Fund	March 2011	2,000
Associazone per la Ricerca tra Italia e Australasia	Research visits to and from Italy	March 2011	6, 300

Sponsorships

Event / Sponsor	Date	Amount $
Annual General meeting, Science at the Shine Dome, ECR and Teachers programs		
Australian Antarctic Division	April 2010	2,000
Defence Science and Technology Organisation	April 2010	4,000
Australian Research Council	April 2010	6,000
National Health and Medical	April 2010	6,000
Bureau of Meteorology	April 2010	2,000
David Craig	April 2010	10,000
Frontiers of Science		
Australian Institute of Marine Science	September 2010	5,000
Western Australia Department of Commerce	October 2010	3,182
Royal Society of London	December 2010	47,720
Haddon Forrester King Medal		
Rio Tinto	June 2010	40,000
Interviews with Australian scientists		
CSIRO Livestock Industries	April 2010	3,182
La Trobe University	April / Aug 2010	6,364
University of Melbourne	May / June 2010	6,364
CSIRO Material Science and Engineering	September 2010	3,182
University of Western Australia	September 2010	6,364
University of Adelaide	November 2010	3,182
Prince Henry's Institute of Medical Research	November 2010	3,182
Monash University	March 2011	3,182
National Museum Student Prize		
National Museum of Australia	December 2010	3,000

Event / Sponsor	Date	Amount $
Nova: Science in the news		
Queensland Resource Council	May 2010	3,000
Department of Agriculture, Fisheries and Forestry	September 2010	5,000
Public Lecture Series		
James Cook University	October 2010	2,824

Academy revenue – general and special project grants

	Received $
General Academy grants	
Higher Education Support Act Learned Academies Program (Grant in Aid)	
Dept of Innovation, Industry, Science and Research	1,254,035
Learned Academies Programme Supplementary funding (Grant in Aid)	
Dept of Innovation, Industry, Science and Research	591,564
Australian Climate Change Science Program	
Department of Climate Change	206,500
Special Project Grants	
French Embassy Cotutelle Program	
French Embassy	7,119
French–Australian Joint Symposium on Innovation in Health Sciences and Biotechnology	
French Embassy	27,739
French–Australian Cooperation on Innovation and Technology	
French Embassy	11,563
Australia 2050: achieving an environmentally sustainable and socially equitable way of living	
Australian Research Council	138,441
Sir Mark Oliphant Frontiers of Science and Technology Conferences (Year 5)	
Dept of Innovation, Industry, Science and Research	100,000
First Australian Earth System Outlook Conference	
ARC Research Network for System Science	7,500
Theo Murphy Think Tank	
Newcrest Mining Limited	11,818
Theo Murphy Think Tank	
Royal Society of London	117,701
UK–Australia Frontiers of Science Marine Meeting	
Royal Society of London	125,000
Climate change science questions	
Department of Climate Change	15,900
DFAT – ACC Next Step Program	
Department of Foreign Affairs and Trade	35,213
Australia–Korea Early Career Researchers Program 2010	
Australia–Korea Foundation (Department of Foreign Affairs and Trade)	20,000
International Science Linkages Strategic Policy – Department of Innovation, Industry, Science and Research	
Science Academies Programme (Year 5)	801,800
International Research Staff Exchange Scheme (IRSES) and ECR exchanges to Europe	5,000
Australia–Indonesia Joint Science and Technology Workshop 2010	37,500
Cooperation in the field of Science and Technology (COST) II extension	206,000

	Received $
Summer Program in Australia for US Graduate Students in Science and Engineering 2010	10,000
Australia–Singapore Biotechnology Workshop	31,913
Delivery of Science Week – Shanghai World Expo 2010	199,000
Australia–Germany Funding initiatives 2010	496,365
Australia–South Africa Innovation Management Symposium	22,174
Australia–China Academies Symposium 2010	139,468
Summer Program in Australia for US Graduate Students in Science and Engineering 2011	85,000
2010–11 Australian Academy of Science speaker series	42,500
Australia–Indonesia Environmental Science Workshop 2011	40,000
Australia–Japan Bilateral Exchange Program 2011	120,000
COST Workshop 2011	20,000
International Research Staff Exchange Scheme (IRSES) 2010/11	245,000
Australia–France Bilateral Symposium on Health Research	50,000
Australia–China Post Symposium Follow up Workshops 2011	77,000

Note: Figures comprise total grant excluding GST

Abbreviations

A*STAR	(Singapore) Agency for Science, Technology and Research
AAD	Australian Antarctic Division
AAS	Australian Academy of Science
AKF	Australia–Korea Foundation
ANSTO	Australian Nuclear Science and Technology Organisation
ANU	Australian National University
ARC	Australian Research Council
ATSE	Australian Academy of Technological Sciences and Engineering
CAS	Chinese Academy of Sciences
CEO	Chief Executive Officer
CODATA	Committee on Data for Science and Technology
COSPAR	Committee on Space Research
COST	European Cooperation in Science and Technology
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
DEEWR	Department of Employment, Education and Workplace Relations
DIISR	Department of Industry, Innovation, Science and Research
DSTO	Defence Science and Technology Organisation
ECR	Early career researcher
EMCR	Early and mid career researcher
FAA	Fellow of the Australian Academy of Science
FASAS	Federation of Asian Scientific Academies and Societies
FRS	Fellow of the Royal Society
FTSE	Fellow of the Academy of Technological Sciences and Engineering
IAC	InterAcademy Council
IAGA	International Association of Geomagnetism and Aeronomy
IAP	InterAcademy Panel on International Issues
ICSU	International Council for Science
ISL	International Science Linkages
IUGG	International Union of Geodesy and Geophysics
JSTCC	Joint Science and Technology Cooperation Committee
LASP	Learned Academies Special Projects
NHMRC	National Health and Medical Research Council
NRF	National Research Foundation (of Korea)
NSL	National Standards Laboratory
OPAL	Open Pool Australian Lightwater
PMSEIC	Prime Minister's Science, Engineering and Innovation Council
RACI	Royal Australian Chemical Institute
RCAP	Regional Committee for Asia and the Pacific
ROAP	Regional Office for Asia and the Pacific
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics

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