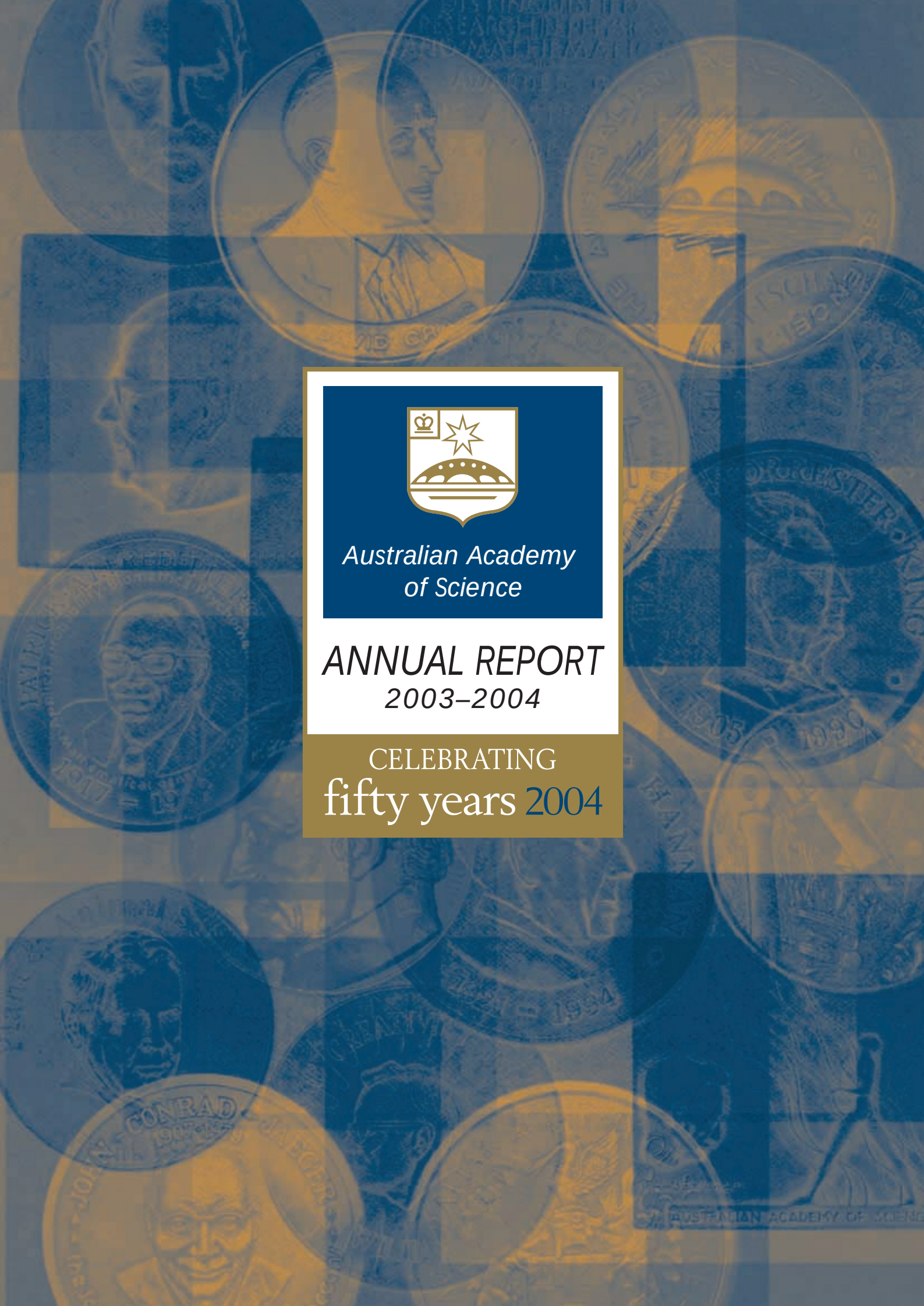

Australian Academy of Science

ANNUAL REPORT
2003–2004

CELEBRATING
fifty years 2004

THE AUSTRALIAN ACADEMY OF SCIENCE

The Australian Academy of Science is an independent, not-for-profit organisation of approximately 370 of Australia's leading scientists. It recognises research excellence, advises government, organises scientific conferences, publishes school textbooks and scientific journals, conducts international scientific relations, and fosters science education and the public awareness of science and technology.

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This report is also available at www.science.org.au/reports/2004anrep.pdf.

Cover: A selection of the Academy's medals, awarded for distinguished research.

Report of the Council

For the year

1 May 2003 – 30 April 2004

Contents

President's foreword

We are now in our 50th Anniversary year. It is a time to reflect on the enormous contributions that science, and our scientists, have made to the well-being of all Australians. It is also a time to think about some of the daunting challenges ahead. For the nation to prosper, our science and technology base must also prosper. This seems so self-evident to us, but the Academy and its Fellowship must continue to promote this message not only to policy makers but also to the community more generally.

You will see in the following pages of this report that the Academy has contributed in the past 12 months to the development of national science policy, to the continuing development of international scientific linkages, and to science engagement and education. We have made a special effort to develop a nationwide commitment to science education of the children and youth of Australia. We have worked closely with the scientific community, the other learned academies, and government policy makers in tackling some of the big challenges facing the nation, on issues ranging from mapping dryland salinity to assessing international global climate change research to primary school science.

Underpinning all of our activities is the awareness that we need to engage and encourage our early to mid-career researchers, not only for their own career development, but also because they have so much to offer! In April 2003 the Academy held its second annual think tank for young researchers, on this occasion to discuss science and national security. Participants discussed novel applications of existing science and technology and identified gaps in knowledge that might be addressed when applying science, including social science, and technology to safeguarding the nation. The think tank focused on four broad areas of application: chemical and biological threats, communications and information technology, infrastructure as a target, and the role of the social sciences. The resulting report was widely commended and was submitted to the new Science, Engineering and Technology Unit in the Department of the Prime Minister and Cabinet.

As part of the Academy's involvement with younger scientists, the inaugural meeting of *Australian Frontiers of Science* was launched in July 2003. The organisers, Andrew Young from CSIRO and Brian Schmidt from the Australian National University, arranged a stimulating program. The aim of the symposium was to bring together the very best young scientists to discuss emerging technologies, new opportunities and exciting advances in their fields. The presentations were to their peers, across many disciplines, and the feedback about potential innovative collaborations was very positive. Our intent is that *Australian Frontiers of Science* will become an annual event, to be held in different capital cities.

In conjunction with the Department for Education, Science and Training, we have developed a program for 34 young Australian researchers to visit the USA or Europe in 2004 to conduct research projects for periods of two to six weeks. The Minister for Science, the Hon. Peter McGauran MP, announced the initiative in September 2003. In a somewhat reciprocal arrangement, the Academy and the US National Science Foundation will jointly sponsor 20 US graduate students to visit Australian laboratories each year, during the North American summer. The two exchange programs have been overwhelmed by large numbers of high quality applications.

I would like to thank outgoing Councillors Jim Angus, Lew Mander and David Pegg for their assistance with many Academy activities over the past three years. Two of our Officers have come to the end of their four-year terms: Bruce McKellar as Secretary (Physical Sciences) and Kurt Lambeck as Foreign Secretary. The efficient operation of the Academy is very much due to these two Officers giving so generously and graciously of their time, wisdom and expertise. I thank them, on behalf of the Fellowship and the Secretariat, for their countless contributions to the Academy. My thanks too on behalf of the Fellowship and Council to the hard-working and skilled Secretariat of the Academy.

Jim Peacock
AC PresAA FRS FTSE

April 2004

Council and administration

The Academy's affairs are conducted by an elected Council of seventeen Fellows. To ensure that Academy business is managed effectively between Council meetings, the Executive Committee has delegated authority. The Committee consists of the President, Secretary (Physical Sciences), Secretary (Biological Sciences), Secretary (Science Policy), Secretary (Education and Public Awareness), Foreign Secretary and Treasurer.

Council members

Dr Jim Peacock[6] – President

Professor Bruce McKellar[4] – Secretary (Physical Sciences) and Vice-President

Professor John Shine[7] – Secretary (Biological Sciences) and Vice-President

Dr Michael Barber[5] – Secretary (Science Policy)

Professor Kurt Lambeck[4] – Foreign Secretary

Professor Ian McDougall[5] – Treasurer

Professor John McKenzie[6] – Secretary (Education and Public Awareness)

More information on Council members is available at www.science.org.au/academy/council/officers.htm.

Ordinary members
(Physical Sciences)

Dr Bob Frater[4]

Professor Peter Hall[6]

Professor Lew Mander[4]

Professor David Pegg[4]

Dr Bob Watts[6]

Ordinary members
(Biological Sciences)

Professor James Angus[4]

Professor Julie Campbell[6]

Professor Suzanne Cory[5]

Professor David Kemp[6]

Professor Andrew Smith[5]

4 Retiring at AGM 2004

5 Retiring at AGM 2005

6 Retiring at AGM 2006

7 Retiring at AGM 2007

The Governor-General, Major-General Michael Jeffery (centre), Mrs Marlena Jeffery and Dr Jim Peacock at the reception at Government House on 19 February to mark the 50th Anniversary of the founding of the Academy (see page 43).

The Fellowship

The Academy Fellowship is made up of 372 of Australia's leading research scientists, elected for their personal contributions to science. Fellows occupy senior positions in universities, the CSIRO and industry.

The Fellowship, 30 April 2004:

Ada, Gordon L
Adams, Jerry M
Anderson, Brian D O
Anderson, Jan M
Anderson, John R
Andrews, Thomas J
Angus, James A
Angyal, Stephen J
Antonia, Robert
Appleby, Cyril A
Archer, Michael
Armstrong, Bruce K
Austin, Colin R
Baddeley, Adrian J
Banwell, Martin
Barber, Michael N
Bartlett, Perry
Bartnik, Robert
Basten, Antony
Batterham, Robin J
Baxter, Robert
Baxter, Rodney J
Beckwith, Athelstan L J
Bedding, Robin A
Bennett, Martin A
Bennett, Maxwell R
Bergersen, Fraser J
Bilger, Robert
Birch, L Charles
Bishop, Peter O
Blanden, Robert V
Blevin, William R
Boardman, N Keith
Boger, David V
Bond, Alan M
Boyden, Stephen V
Brennan, Maxwell H
Brent, Richard P
Brown, Gavin
Brown, Ronald D
Bruce, Michael I
Buchdahl, Hans A
Budd, William F
Burdon, Jeremy J
Burger, Henry G
Burgess, Antony W
Burke, David J
Burnstock, Geoffrey
Campbell, Julie H
Campbell, Kenton S W
Canty, Allan J
Carver, John H
Cavill, George W K
Chalmers, John P
Chappell, Bruce W
Chappell, John M A
Christiansen, W N
Clarebrough, Leo M
Clark, Graeme M
Clark, Robert, G
Clarke, Adrienne E
Cockburn, Andrew
Cole, Andrew R H
Cole, Keith D
Colless, Matthew
Colman, Peter M
Coltheart, Max
Compston, William
Cook, David
Cory, Suzanne Y
Costa, Marcello
Costin, Alec B
Cowan, Ian R
Cowley, John M
Cowling, Michael G
Cowman, Alan, F
Cox, Graeme B
Craig, David P
Crompton, Robert W
Crossley, Maxwell
Crozier, Ross
Curtis, David R
Dance, Ian G
Dancer, E Norman
Day, Maxwell F C
Day, Ross H
de Kretser, David M
Delbourgo, Robert
Dennis, Elizabeth S
Denton, Derek
Dewar, Robert L
Doddrell, David M
Doherty, Peter C
Dopita, Michael A
Dracoulis, George
Drummond, Peter
Dunn, Ashley R
Easton, Christopher
Ekers, Ronald D
Elliott, William H
Ellis, Graeme R A
Esler, Murray D
Evans, Denis J
Evans, Lloyd T
Evans, Robin J
Ewens, Warren J
Farquhar, Graham D
Fenner, Frank J
Field, Leslie D
Figgis, Brian N
Flambaum, Victor V
Fletcher, Neville H
Forrester, Peter
Fraser, R D Bruce
Frater, Robert H
Frazer, Ian
Freeman, Hans C
Freeman, Kenneth C
Furness, John B
Gage, Peter W
Gandevia, Simon C
Gani, Joseph M
Gascoigne, Ben
Gibbs, Adrian J
Gibson, Frank W E
Gilbert, Robert G
Gleadow, Andrew J W
Goodnow, Christopher C
Goodwin, Graham C
Graham, Robert M
Graves, Jennifer A M
Green, David H
Green, Martin A
Griffiths, Ross W
Grimshaw, Roger H J
Groves, David
Gunning, Brian E S
Guttmann, Anthony J
Haddad, Paul
Hales, Anton L
Hall, Peter G

The Fellowship is listed at www.science.org.au/academy/fellows/fellow.htm.

Hamann, Sefton D
Haneman, Dan
Hannaford, Peter
Hardham, Adrienne R
Hatch, Marshall D
Head, Alan K
Healy, Thomas W
Heyde, Christopher C
Higgins, T J
Hilton, Douglas
Hirst, G David S
Hobbs, Bruce E
Hobbs, Richard
Hoffman, Ary
Holloway, Bruce W
Holman, Mollie E
Holt, Patrick
Horridge, G Adrian
Hughes, Terence P
Hunter, Robert J
Hurst, C Angas
Hush, Noel S
Hutchinson, John E
Hyde, Bruce G
Hynes, Michael
Imberger, J
Israelachvili, Jacob N
Jacobsen, John V
Jameson, Graeme J
Jeffrey, Shirley W
Johnstone, Brian M
Jones, The Hon. Barry O
Kelly, G Maxwell
Kemp, Bruce E
Kemp, David J
Kennett, Brian L N
Kerr, Allen
Kerr, John F R
Kivshar, Yuri S
Klein, Anthony G
Korner, Paul I
Kotagiri, Rao
Kuchel, Philip W
Ladiges, Pauline Y
Lambeck, Kurt
Lance, James W
Larkins, Francis P
Law, Phillip G
Le Couteur, Kenneth J
Lehrer, Gustav I
Letham, David S
Levick, William R
Lindoy, Leonard F
Linnane, Anthony W
Lovering, John F
Lumbers, Eugenie R
Lyons, Lawrence E
McCarthy, Ian E
McCloskey, D Ian
McComb, Arthur J
McCormick, Paul G
McCracken, Kenneth G
McCulloch, Malcolm
McDougall, Ian
McDougall, Trevor J
McElhinny, Michael W
McEwan, Angus D
McFadden, Phillip L
McIntosh, Alan G R
McIntosh, Robert A
McKay, Brendan D
Mackay, Ian R
McKellar, Bruce H J
McKenzie, John A
McLachlan, Elspeth M
McLeod, James G
Mai, Yiu-Wing
Main, Albert R
Manchester, Richard N
Mander, Lewis M
Marcelja, Stjepan
Marshall, Barry J
Martin, Raymond L
Martin, T John
Masters, Colin L
Mathieson, Alexander M
Mayo, Oliver
Melrose, Donald B
Mendelsohn, Frederick
Metcalf, Donald
Meyer, Richard E
Milburn, Gerard J
Miller, Jacques F A P
Millis, Nancy
Mills, Bernard Y
Mitchell, Graham F
Moodie, Alexander F
Moore, John B
Moran, William
Morrison, James D
Morton, Donald C
Mould, Jeremy R
Myers, Rupert H
Napper, Donald H
Newton, John O
Nichol, Lawrence W
Nicola, Nicos A
Ninham, Barry W
Norrish, Keith
Nossal, Sir Gustav
Nugent, Keith A
O'Reilly, Suzanne Y
Orlowska, Maria
Osborne, Michael R
Osmond, C Barry
Paddon-Row, Michael N
Paltridge, Garth W
Passioura, John
Pate, John S
Paterson, Mervyn S
Peacock, W James
Pearman, Graeme I
Pegg, David T
Pettigrew, John D
Phan-Thien, Nhan
Pickett-Heaps, Jeremy D
Pittard, A James
Porter, Robert
Potts, Renfrey B
Poulos, Harry G
Praeger, Cheryl E
Quirk, James P
Radom, Leo
Ralph, John
Randolph, Mark
Redman, Stephen J
Reeves, Peter R
Reid, Allen F
Renfree, Marilyn B
Rickards, Rodney W
Ritchie, Ian M
Rizzardo, Ezio
Robinson, Brian J
Robinson, Derek W
Robson, Richard
Rogers, Colin
Rogers, George E
Rogers, Lesley J
Ross, Ian G
Rubinstein, Hyam
Runnegar, Bruce N
Sambrook, Joseph F
Sara, Vicki R
Sargeson, Alan M
Seneta, Eugene
Sharman, Geoffrey B
Shine, John
Shine, Richard
Short, Roger V
Shortman, Kenneth D
Simon, Leon
Slatyer, Ralph O
Sloan, Ian H
Smith, F Andrew
Smith, Sally
Smyth, David
Snyder, Allan W
Solomon, David H
Speed, Terence P
Sprent, John F A
Sridhar, Tamarapu

Srinivasan, Mandyam V
Stalker, Raymond J
Stanley, Fiona
Stanton, Richard L
Stephenson, D George
Sternhell, Sever
Stokes, Robert H
Stone, Jonathan
Strasser, Andreas
Street, Robert
Street, Ross H
Sullivan, Colin E
Summons, R E
Sutherland, Grant R
Sutherland, Robert L
Swan, John M
Symons, Robert H
Szekeres, George
Tanner, Roger I
Taylor, S Ross
Thomas, Anthony W
Thompson, Arthur M
Thompson, Colin J
Trudinger, Neil S
Truswell, Elizabeth M
Tuck, Ernest O
Tucker, Rodney S
Turner, J Stewart
Tyerman, Stephen
Tyndale-Biscoe, C Hugh
Underwood, Antony J
Vaux, David
Veevers, John J
Vincent, Robert
von Itzstein, Mark
Wake, R Gerard
Walker, N Alan
Wall, Gordon E
Wallace, Henry R
Walter, Malcolm
Watts, Robert O
Weigold, Erich
Weiss, Donald E
Wentrup, Curt
White, Guy K
White, John W
Whitten, Maxwell J
Whitten, Wesley K
Wild, J Paul
Wild, S Bruce
Williams, James F
Williams, James S
Williams, Robyn
Williamson, Richard
Williamson, Robert
Wintour-Coghlan, E Marelyn
Wiskich, Joseph T
Womersley, Hugh B S
Woodall, Roy
Worner, Howard K

New Fellows

We congratulate the following scientists who were elected to Fellowship on 25 March 2004.

Professor Robert Antonia

- Professor, Discipline of Mechanical Engineering, School of Engineering, University of Newcastle, New South Wales

Professor Martin Banwell

- Professor of Chemistry, Research School of Chemistry, Australian National University, Canberra

Professor Robert Bartnik

- Professor of Mathematics, School of Mathematics and Statistics, University of Canberra

Professor Robert Baxter

- Director, Kolling Institute of Medical Research, Royal North Shore Hospital, St Leonards, New South Wales

Dr Matthew Colless

- Director, Anglo-Australian Observatory, Epping, New South Wales

Professor David Cook

- Professor of Cell Physiology, Epithelial Transport Laboratory, Department of Physiology, University of Sydney

Professor Christopher Easton

- Professor of Chemistry, Research School of Chemistry, Australian National University, Canberra

More information on each of the new Fellows is available at www.science.org.au/academy/fellows/2004.htm.

Professor Peter Forrester

- Professor and ARC Professorial Fellow, Department of Mathematics and Statistics, University of Melbourne

Professor Ian Frazer

- Director, Centre for Immunology and Cancer Research, University of Queensland

Professor Paul Haddad

- Professor of Chemistry and Deputy Head, School of Chemistry, University of Tasmania

Dr T J Higgins

- Chief Research Scientist/Assistant Chief, CSIRO Plant Industry, Canberra

Dr Douglas Hilton

- Principal Research Fellow, Walter and Eliza Hall Institute of Medical Research, Melbourne

Professor Richard Hobbs

- Professor of Environmental Science, Deputy Head, School of Environmental Science, Murdoch University, Western Australia

Professor Ary Hoffmann

- Professor of Genetics and Director, ARC Special Research Centre (Centre for Environmental Stress and Adaptive Research–CESAR), La Trobe University, Melbourne

Professor Ramamohanarao (Rao) Kotagiri

- Professor of Computer Science, Head of the Department of Computer Science and Software Engineering, University of Melbourne

Professor Malcolm McCulloch

- Professor, Environmental Geochemistry and Geochronology, Research School of Earth Sciences, Australian National University, Canberra

Professor David Smyth

- Professor, School of Biological Sciences, Monash University, Melbourne

Professor Robert Vincent

- Personal Chair in Physics, University of Adelaide

Professor Malcolm Walter

- Director, Australian Centre for Astrobiology, Department of Earth and Planetary Sciences, Macquarie University, Sydney

Professor E Marelyn Wintour-Coghlan

- NHMRC Senior Principal Research Fellow, Department of Physiology, Monash University, Melbourne

Special Election

Professor Nancy Millis

- Emeritus Professor, Department of Microbiology, University of Melbourne

Mr John Ralph

- Chairman, Commonwealth Bank of Australia, Melbourne

Corresponding Members

Professor John S Boyer

- E I Dupont Professor of Marine Plant Biochemistry/Biophysics and Professor of Plant and Soil Sciences, College of Marine Sciences, University of Delaware, USA

Professor Gunnar Öquist

- Secretary-General of the Royal Swedish Academy of Sciences and Professor of Plant Physiology, Umeä University, Sweden

Honours awarded to Fellows during the year

Dr Robin Batterham

- Officer of the Order of Australia (AO)

Professor Graeme Clark

- Elected to the Royal Society of Medicine (London) as an Honorary Fellow
- Companion of the Order of Australia (AC)

Professor Adrienne Clarke

- Companion of the Order of Australia (AC)

Professor Peter Doherty

- Inaugural Curtin Medal for Medical Research

Professor Ron Ekers

- President, International Astronomical Union

Professor Frank Fenner

- Frank Fenner Building, Australian National University

Professor Frank Gibson

- Member of the Order of Australia (AM)

Professor David Green

- Elected to the Russian Academy of Sciences as a Foreign Member

Professor Jennifer Graves

- Research featured on Australian postage stamp

Associate Professor Robert Hunter

- Member of the Order of Australia (AM)

Dr Brendan McKay

- Australian Skeptics' Eureka Prize for Critical Thinking

Professor Jacques Miller

- Companion of the Order of Australia (AC)
- Prime Minister's Prize for Science

Professor Mervyn Paterson

- Walter Hermann Bucher Medal of the American Geophysical Union

Professor Harry Poulos

- Annual Terzaghi Lecture
- Australian Civil Engineer of the Year

Professor Ian Ritchie

- Western Australian Premier's Prize for Achievement in Science

Professor Roger Short

- Member of the Order of Australia (AM)

Professor Leon Simon

- Elected to the Fellowship of the Royal Society

Professor Roger Summons

- Alfred Treibs Award

Professor Raymond Stalker

- Officer of the Order of Australia (AO)

Dr David Vaux

- Victoria Prize

Dr Robert Williamson

- Officer of the Order of Australia (AO)

Regional groups

The following reports for the period 1 May 2003 to 30 April 2004 have been received:

Australian Capital Territory

Chair: Professor John White

The ACT regional group meets regularly with Fellows from other learned Academies, under the auspices of the Fellows' Dining Club, for guest lectures and dinner. In the past year guest lecturers have included Professor Jenny Graves, Professor Rod Home, Dr Brendan McKay and Professor Tony McMichael. The Dining Club is organised by Dr John Passioura and Professor Ross Taylor. ACT Fellows and their guests met for Christmas dinner on 5 December. Many ACT Fellows and friends of the Academy were present at the National Press Club on 16 July when Dr Jim Peacock gave a televised address on 'Gene technology and the troubles with food'.

New South Wales

Chair: Professor Don Napper

Professor Napper represented the Academy in judging a prize for science writing in *Campus Review*'s Dialogica Awards. The Academy sponsored a $3000 special prize for excellence in communication on a scientific topic. The prize was awarded to Dr Joseph Hope, Australian National University, for an essay on quantum mechanics.

Queensland

Chair: Professor Julie Campbell

Dr Jim Peacock addressed Fellows and friends of the Academy at a seminar held on 8 May at the University of Queensland, to discuss ongoing and future activities of the Academy. Informal discussions continued over dinner at the Customs House.

In 2003, five of the sixteen new Fellows elected to the Academy were based in Queensland. Julie Campbell brought this matter to the attention of a number of potential sponsors and now has the resources to underpin a range of activities planned for the Queensland group. An inaugural event was a public forum for the new Fellows to present their work. On 10 September, four of the new Fellows and the 2003 Pawsey Medallist gave short talks on their research, followed by a reception at the Customs House.

South Australia

Chair: Professor Andrew Smith

The group held a meeting in January and discussed the following matters:

- Issues that related to Council procedures, as raised by Professor J P Quirk, in material circulated to Fellows.
- Matters relating to the Academy's 50th Anniversary year.
- The nature of the Academy's AGM and whether its usefulness as a forum for discussing policy changes can be improved.
- Reactivation of the Regional Group, and its role, especially in interfacing with the South Australian State Government and as a forum for providing additional information to Fellows about material emailed from the Academy.
- An apparent down-turn in numbers of candidates for election being put forward from South Australia, with discussion of the perceived profile of science in South Australia, for example in the universities.

Victoria

Chair: Professor Tony Klein

On 27 May a 'Welcome Symposium' was held for the new Victorian Fellows who were elected in 2003. The Fellows gave brief talks on their research and these were followed by cocktails and dinner.

In 2003 it was the turn of the Victorian group of the Australian Academy of Technological Sciences and Engineering to organise the Joint Academies dinner, which was held on 12 August. The after-dinner speaker and guest of honour was the Reverend Dr John Scott, former Vice-Chancellor of La Trobe University, whose address was titled: 'Lies, Damned Lies and Statistics'.

The traditional Christmas dinner was held on 27 November at the Observatory Café in the Royal Botanic Gardens, a delightful and apposite setting.

A public lecture was given on 25 February by the 2004 Selby Fellow, Professor David Pritchard of the Massachuetts Institute of Technolgy. The title of his lecture was: 'Bose-Einstein Condensation - The Coldest Place on Earth'.

Deaths since 1 May 2003

We regret to record the following deaths:

Professor Richard Mark, 13 August 2003

Mr Harry Minnett AO FTSE, 20 December 2003

Professor Alan Wardrop, 19 May 2003

Professor John Young, AO FRACP, 10 February 2004

Science policy

Overview

The science policy scene in Australia has been extremely active over the past year (1 May 2003 to 30 April 2004). The four major National Research Priorities (NRPs), set in late 2002, were enhanced in late 2003 by incorporating perspectives from the social sciences and humanities into the framework. The expert committee advising on the NRPs was chaired by Academy President, Dr Jim Peacock.

Dr Peacock and Council member Professor Julie Campbell were also involved in the high-level expert committee that reviewed implementation plans for the NRPs, as developed by 22 of Australia's leading government research agencies and funding bodies. The committee was chaired by the Chief Scientist, Dr Robin Batterham. The Minister for Science, the Hon. Peter McGauran MP, stated in a November press release that 'Australian Government research organisations have demonstrated a strong commitment to aligning their activities to the national research priorities, providing a firm basis for Australia's future prosperity.'

Another major and complementary review process undertaken in 2003 was that conducted by the National Research Infrastructure Taskforce. The Academy provided a substantial submission to the process that focused on the approach to supporting Major National Research Facilities (MNFRs) and other large research facilities, and drew on an analysis conducted by the Academy of the nature and extent of unmet demand for research infrastructure funding. The analysis revealed a significant shortfall in government-sourced funding and the need to improve the scope for leverage.

In September, in response to the many Government reviews concerning the nation's capacity for research, science and innovation, and improving the quality of life for Australians, the Academy released a *Policy Statement on Research and Innovation in Australia*. The statement contains 13 key recommendations which the Academy hopes will influence the decision and policy-making process underpinning Australia's innovation system.

The Academy has been involved in a number of other important science policy issues and activities throughout the year, such as the *Science and Innovation Mapping* exercise conducted by the Department of Education Science and Training. The reference group for the mapping exercise was chaired by Dr Robin Batterham and included Professor Suzanne Cory, Professor Graham Farquhar, Dr Bruce Hobbs and Dr Jim Peacock. The Academy, under the direction of Dr Michael Barber, Secretary, Science Policy, has played a high-profile role in these policy debates. Dr Peacock, is an *ex officio* member of PMSEIC, the Prime Minister's Science, Engineering and Innovation Council. He chaired a working group on the topic of science engagement and education for the November meeting of PMSEIC.

The Academy obtained support from the ARC's Learned Academies Special Project Scheme for 2003 for benchmarking Australia's performance in nanotechnology. This work was facilitated by the appointment of a dedicated research assistant. For 2004, ARC funding has been awarded for a special project on maximising the benefits from Australia's international scientific linkages.

Over the past year the Academy has produced a wide range of submissions, statements and reports and delivered public lectures and presentations. Some of these are summarised below. In a number of policy areas the Academy has worked closely with the other learned academies, demonstrating how each academy brings to bear its own, very distinct, capabilities.

Reports and submissions issued by the Academy are available at www.science.org.au/reports. Media releases are available at www.science.org.au/media.

Contributions to national strategies and priorities

Policy Statement on Research and Innovation in Australia

A major science policy initiative for the year was the development by the Academy of a *Policy Statement on Research and Innovation in Australia.* The statement was released in September in response to the many reviews taking place in the latter half of 2003. These reviews formed part of a comprehensive assessment of Australia's research and innovation system to inform Government on the development of new science and innovation measures to apply after 2005-2006. This date represents the end of phase one of *Backing Australia's Ability,* the Government's key innovation strategy and funding package announced in January 2001.

The release of the Academy's policy statement represented an important update of *Priorities in Research and Innovation for the Next Australian Government*, produced by the Academy in October 2001 in the lead-up to the last Federal election. The new policy statement presents a useful view of the current status of research and innovation in Australia. It also produced 13 key recommendations to input into the decision and policy-making process underpinning Australia's innovation system. These relate to:

- building a knowledge economy
- private investment in research and development
- other incentives to stimulate private investment in research and development
- CSIRO and other publicly-funded research agencies
- the higher education system
- science and mathematics education and awareness
- major national research facilities (MNRFs)
- cooperative research centres (CRCs)
- the roles of State and Commonwealth governments
- the international dimension.

In his foreword to the policy statement, Dr Jim Peacock welcomed the ongoing national debate about science, engineering and technology and said that he was encouraged by the high level of general agreement across the political spectrum that Australia's economic and social well-being is critically dependent on the ability to capture the benefits of a strong science and innovation system. He expressed concern for the widening gap between Australia's gross expenditure on research and development and the OECD average–a feature largely influenced by previous low business investment in research and development. He also noted the increasing concern to the general community of higher education issues–particularly in the areas of science and mathematics. Dr Peacock concluded that the Academy is convinced that a strength of the Australian science and innovation system is the pluralistic nature of the funding arrangements and the management structures of the various organisations in the system. This, together with the National Research Priorities, should further strengthen the system, and enhance the competitiveness and contestability of Australia's innovation system. The policy statement is available at www.science.org.au/reports/10september03.pdf.

International climate change science–Australia's role, links and opportunities

The Academy, as the relevant organisation that provides links between Australian and international climate change science programs, was asked by the Australian Greenhouse Office to assemble a comprehensive inventory of significant global climate change research programs and to provide a preliminary overview of Australia's current engagement in the various programs and projects at the international level. Such a preliminary audit provides useful information for determining Australia's current and future involvement in international climate change research and administration, and assists with the identification of major gaps and possible opportunities to leverage Australia's domestic research effort and resource base. The final report identified ten recommendations for Australia's role and research in the international climate change science scene. The report (available at www.science.org.au/reports/ago.pdf) was prepared by a steering group which was chaired by the Academy's Foreign Secretary, Professor Kurt Lambeck, and included Dr Michael Manton, Dr Michael Raupach and Dr John Zillman. The Academy also recognises the useful contributions made by Professor Graham Farquhar and Dr Will Steffan.

Review of Salinity Mapping Methods in the Australian Context

The Academy (together with the Academy of Technological Sciences and Engineering) undertook an important role in the Review of Salinity Mapping Methods in the Australian Context, which was commissioned by the Government on behalf of the Natural Resource Management Standing Committee (NRMSC) of the NRM Ministerial Council. In order to fulfill their review function the joint Academies undertook a number of activities. The first was to convene a workshop at the Academy in September, where 24 leading scientists were invited to critically examine the first working draft of the review and to offer advice on its further revision. The Academies then hosted a public forum at the Shine Dome in October, where more than 70 participants spent the day reviewing the modified draft reports in a series of sessions that were guided by presentations from leading scientists in their field. The full transcript of the forum is available at www.science.org.au/proceedings/salinity. A panel of five scientists was then invited by the joint Academies to undertake a final review of the reports. The panel members were Professor Kurt Lambeck (Chair), Dr Andy Green, Dr John Ive, Professor John Lovering and Dr Ian Rae. The review reports (a technical report and a user-friendly guide) will be published by the Department of Agriculture, Fisheries and Forestry.

Nanotechnology Benchmarking Project

The Academy's Nanotechnology Benchmarking Project was completed in February. The project was funded under the ARC's Learned Academies Special Grants Scheme. The aims of the project were to develop an effective means of benchmarking research performance in emerging areas of science and technology in Australia, and to pilot this adapted methodology by examining Australian research performance in nanotechnology. The benchmarking methodology included developing a comprehensive list of keywords related to the field, performing a bibliometric analysis of the field, and a rigorous peer review and survey of leading researchers to validate the keywords and the findings from the bibliometric analysis. The study found that Australian nanotechnology researchers are producing high-quality work across all areas of nanotechnology, but there is evidence that we are not advancing our capabilities as quickly as the rest of the world. The findings also suggested that Australia may fall further behind in the future unless nanotechnology is maintained as a national research priority and funded accordingly. The steering group for the project was chaired by the Academy's Secretary, Physical Sciences, Professor Bruce McKellar, and included Professor Frank Caruso, Professor Bob Clark, Dr Bruce Cornell, Associate Professor Andrew Dzurak, Professor Chennupati Jagadish and Professor Paul McCormick. The Academy also acknowledged the data and expert advice on bibliometric analysis provided by Dr Linda Butler. The report is available at www.science.org.au/policy/nanotech.htm.

Census of Marine Life

More than 50 nations–including Australia–are contributing to the Census of Marine Life–a US$1 billion, 10-year global initiative to assess and explain changes in diversity, distribution and abundance of life in the oceans.

The project will advance scientific knowledge of marine biodiversity, build international cooperation and technology, and respond to research needs for the decade. It also promises to assist countries to meet other needs such as providing information for issues related to biodiversity conservation, marine protected areas, sustainable fisheries, habitat loss and pollution, and global climate change. All information collected will be available online for scientists and the general public via the Ocean Biogeographic Information System (OBIS).

Australia is represented on the international steering committee overseeing the project by Dr Ian Poiner, CSIRO Marine Division. The Academy is represented on Australia's national steering committee by Dr Terry Hughes of James Cook University, and the Academy's Senior Science Policy Analyst, Dr Gina Newton, (who is also Vice-President of the Australian Marine Sciences Association). The committee met in October and November to discuss terms of reference, the development of a five-year plan and a launch event for the project.

Funding and infrastructure policy

National Research Infrastructure Taskforce

In recognition of the importance of infrastructure to the research efforts of Australia, the Minister for Education, Science and Training, the Hon. Dr Brendan Nelson MP, established the National Research Infrastructure (NRI) Taskforce in May to develop a National Research Infrastructure Strategy. The National Academies Forum was represented on the Taskforce by Dr Phil McFadden. The Taskforce also included Dr Michael Barber. The NRI Strategy sets out a strategic framework within which to ensure effective investment in research infrastructure. It also aims to ensure that funded infrastructure is used effectively and productively and remains relevant and viable for the research it supports.

The Taskforce's national consultation process drew 110 submissions, including a substantial submission from the Academy (www.science.org.au/reports/23july03.pdf). In its final report to the Minister at the end of October, the Taskforce, chaired by Dr Mike Sargent, reinforced the view that a high-quality research sector is an essential component of national competitiveness and that lack of access to research infrastructure of relevance and of global significance is likely to limit the outcomes and quality of research–a view increasingly held by many other nations. The Taskforce also proposed a series of investment principles to be adopted by all publicly-funded research agencies and funding agencies. These generally call for a strategic and cooperative approach to investment–as opposed to the more traditional competitive process typical of funding for research themes or projects.

Australia's international scientific linkages

The Academy has been funded under the ARC's Learned Academies Special Projects Scheme to undertake a study in 2004 on maximising the benefits from Australia's international scientific linkages. The study aims to assemble an inventory of significant international research programs in which Australian scientists might reasonably be expected to be involved. This will allow Australia's current participation to be set against the wider set of opportunities for international engagement. The project will evaluate mechanisms that enhance Australian scientific involvement in international programs, including the mechanism of subscriptions to international scientific organisations. The planned outcomes are to ensure more targeted investment in areas of national priority and increased leverage of international scientific resources for the benefit of Australia. The steering group for the study will be chaired by Professor Kurt Lambeck.

National Academies Forum
Workshop on Measuring Excellence in Research

The Academy has for some years advocated the need for refinement in the way research excellence is measured. It is essential to concentrate excellence in particular areas of research in particular institutions, permitting a concentration of resources and research infrastructure to underpin a critical mass of research capability. There has also been recent criticism over the current methodology used for assessing research performance and the linkage of this with various granting processes. These factors led to the National Academies Forum, a joint initiative of the four learned Academies, holding a workshop on 23 March to scope a public forum on the topic of measuring excellence in research and research training. The timeliness of the Academies' involvement in this issue was reinforced by the Minister for Science, Education and Training, the Hon. Dr Brendan Nelson MP, who the next day during an address at the National Press Club released three important reports, one of which stressed the need to revisit the current framework of assessing research quality.

The National Academies Forum workshop was facilitated by Dr Michael Barber, Secretary, Science Policy, who called on each Academy to provide a description of excellence in scholarship and research within the context of each Academy's disciplines. The joining of the four learned Academies in this project ensures that the perspectives of each area of discipline will be given proper consideration. The aim of the public forum, to be held in June, is to encourage discussion and debate on the topic and identify a way forward.

From left: Dr Mike Sargent (Australian Academy of Technological Sciences and Engineering), Professor Sue Richardson (President, Academy of the Social Sciences in Australia), Professor Iain McCalman (President, Australian Academy of the Humanities), and Dr Michael Barber (Australian Academy of Science) at the workshop.

National Committees for Science

Further information about the National Committees is available at www.science.org.au/natcoms/.

The Academy has 22 National Committees which are widely representative of its disciplines. The broad aims of the committees are to foster a designated branch or theme of natural science in Australia and to serve as a link between Australian scientists and overseas scientists in the same field.

The process of appointment to a Committee is as follows. Nominations for Committee members are sought by the Academy from Committee chairs and from the relevant corresponding scientific societies. The nominations are then considered by the Academy's Executive Committee, which is responsible for appointing Committee chairs and members. Guidelines for National Committees are available at www.science.org.au/natcoms/guidelines.htm.

The Academy appoints delegations to the business meetings of the International Council for Science's (ICSU) bodies, after advice from the Committees.

Committee reports

Reports covering the period January to December 2003 have been received from the following Committees:

Members of the National Committee for Biomedical Sciences at the Academy in May.

Biomedical Sciences

Chair: Professor Philip Kuchel

The members of the Committee met in May at the Academy. Professor Rob Sutherland was elected deputy chair. The meeting resolved to provide information on the activities of relevant Australian scientific societies over the past 10 years to Professor Frank Fenner for his book, *The First 50 Years*, which is being produced to celebrate the Academy's 50th Anniversary year. Members have been active in promoting Australian involvement in the various ICSU councils; notable amongst these was the International Union for Pure and Applied Biophysics (IUPAB), in which Professor Cris dos Remedios (University of Sydney) and Associate Professor Frances Separovic (University of Melbourne) are respectively a Vice President and a Council Member. The Committee also supported a request for funds to support the involvement of two members of the Australian Society for Biochemistry and Molecular Biology (ASBMB) in the International Union of Biochemistry and Molecular Biology (IUBMB) activities in Toronto in 2003.

The Australian Physiological and Pharmacological Society (APPS) has resolved to change its name to the Australian Physiological Society, to better reflect its constituency. It remains very active and has plans for International Union of Physiological Sciences (IUPS) involvement in the next three years. The Australian Microbiological Society (AMS) is a vibrant society and it too has plans for the next joint meeting of the three divisions of the International Union of Microbiological Societies (IUMS). This will be hosted by the American Society for Microbiology in San Francisco in 2005, with planned Australian involvement.

Overall, the scientific activities within Australia in the areas covered by the Committee are intense. Links to the respective international councils are good, with Australian scientists in key positions on several of the councils.

Chemistry

Chair: Professor Allan Canty

Australia was well represented at the International Union of Pure and Applied Chemistry (IUPAC) Congress and Council Meeting held in Canada in August. Participants included Professor Bob Gilbert, Professor David Black, Professor John Ralston, Professor Allan Canty and Professor Mary Garson. Professor Black was elected Secretary-General of IUPAC. This is a prestigious appointment that should have considerable benefit to Australian chemistry. Professor Gilbert continues to serve as a member of the IUPAC Bureau. Professor Ralston has been appointed as Australia's representative on the new IUPAC Advisory Committee. Dr Andrew Whittaker was appointed as the Australian National Representative on the Macromolecular Division Committee for two years.

The Committee believed that it would be timely to conduct a review of the role of the chemical sciences as an enabling science in contributing to the advancement of Australian science, with particular reference to developments in the interface sciences such as nanosciences, biotechnology, environmental science and natural resource management. The aim was to build upon the outcomes of the 1993 Strategic Review of Chemistry and to make recommendations about the strategic directions for the advancement of the chemical sciences over the next decade. While there was strong support for the proposal among representatives from universities and research institutions, the ARC declined to provide financial support for the initiative in 2003 because of uncertainty in regard to outcomes from the ARC Research Networks initiative.

The Committee investigated the feasibility of conducting an Academy forum to highlight the important role that the enabling sciences must play if the desired outcomes of the National Research Priorities agenda are to be achieved. A joint working party was formed with the National Committee for Physics and the National Committee for Mathematics. While the proposal was considered to have considerable merit, in view of the many research-related reviews being conducted by the Department of Education Science and Training, it was concluded that the second half of 2003 was not a suitable time to achieve a high level of participation in a discussion of this important topic. The proposal will be re-examined in 2004.

Crystallography

Chair: Professor John White

The Committee met on two occasions during 2003. The first meeting was held in January during a Synchrotron Workshop which was organised by the Victorian Government. Four of the Committee members have served on the National Scientific Advisory Council of the Australian Synchrotron and provide advice back to the Committee on its progress. The second meeting coincided with the national meeting of the Society for Crystallographers in Australia and New Zealand (SCANZ) at Broome in August. The Asian Crystallographic Association (AsCA) also met at this time in Broome and the joint meetings were an outstanding success, with a scientific program of the highest calibre. A session devoted to synchrotron radiation was especially timely and well received. Once again, the SCANZ Maslen Scholarship fund provided support for many students to attend the Society's meeting. The Committee continues to have strong representative membership from the elected office holders of SCANZ.

The Committee has maintained a watching brief over the development of the replacement research reactor and the Australian synchrotron, and through both its chair and members has participated actively in the public debate over the need for an Australian synchrotron.

A decision to undertake a review of crystallography in Australia was taken in January 2003. The terms of reference for the review are yet to be established, but it is anticipated that this review will be one of the major activities of the Committee during 2004.

Earth Sciences

Dr Phil McFadden

An important activity in 2003 was the development of a *National Strategic Plan for the Geosciences*, with support from the ARC's Learned Academies Special Project Scheme. The plan is presented as a framework within which the geosciences can develop their contribution to major national and global issues and ensure the maintenance of research excellence. It is available at www.science.org.au/natcoms/earth-strategic.pdf.

As part of the strategic planning process the Committee initiated bid processes to hold several large international geoscience conferences in Australia. Australia was successful with the bid for the International Association of Geodesy (IAG). For reasons that had nothing to do with the quality of the bid, Australia's bid for the next International Union of Geodesy and Geophysics (IUGG) was not successful.

At the Committee's request, Dr Ian Lambert has drawn together a committee to make a bid for the 2012 International Geological Congress (IGC) meeting. This committee will be using the Australian Geoscience Council (AGC) as the incorporated body responsible for the bid. Between Dr Lambert's committee and the AGC there is representation from almost all aspects of Australia's geological community. This activity will provide a strong focus for Australian geologists over the next few years.

Geography

Chair: Professor David Gillieson

The Committee has continued organisation for the 2006 International Geographical Union (IGU) Congress in Queensland. A steering group is co-chaired by Professor John Holmes (University of Queensland) and Professor Warren Moran (University of Auckland). Other members include the President of the Institute of Australian Geographers (IAG), the President of the New Zealand Geographical Society and the Chairs of the Australian and New Zealand National Committees for Geography. Two reports have been produced outlining the conference organisation, themes, symposia and IGU commission participation. Logistic planning is well underway. Australian geography will be well represented and showcased at the 2004 IGU Congress in Glasgow, with travel support funding for early-career researchers.

The Committee has commenced work on a report on the status of geography in Australia, which will provide useful information for strategic planning. Currently a survey of geographical research (fields and publications) is being conducted by Professor Jamie Kirkpatrick of the University of Tasmania. The Committee also developed a proposal for the Australian Bureau of Statistics (ABS) to better define the geographical sciences as a coherent and rigorous discipline. A positive response from the ABS has invited the Committee to be involved in the redefinition of the 'Fields of Education–Geography'.

Professor Kathie Gibson (Australian National University) has undertaken the task of strengthening international liaison with geographers in the South-East Asian and Western Pacific regions. During 2003 written reports were received from the following Corresponding Scientific Societies: Australian Geography Teachers Association; Geographical Society of NSW; Royal Geographical Society of Queensland; Royal Geographical Society of Australasia, SA Branch; Institute of Australian Geographers; Spatial Sciences Institute.

History and Philosophy of Science

Chair: Professor Rod Home

Professor Home participated in a 'meeting of experts' held in Paris in April to resolve various technical issues involved in a major initiative being developed by the Division of History of Science, International Union of the History and Philosophy of Science (IUHPS), to create an *Online Dictionary of National History of Science Bibliographies and Registers of Archival Sources.*

The Committee considered proposals relating to membership and voting rights in the Division of Logic, Methodology and Philosophy of Science, IUHPS, that were voted on at the General Assembly of the Division in August, and prepared voting instructions for the Australian delegation.

During a visit to Australia in December of a high-level delegation of sociologists of science from Taiwan, and as part of its ongoing project to strengthen Sino-Australian links in the history, philosophy and social studies of science, the Committee sponsored a very successful one-day symposium at the University of New South Wales on 'Science Studies and Public Policy: A Sino-Australian Conversation'.

Mathematical Sciences

Chair: Professor Peter Hall

The Committee did not meet during 2003 but email discussions were held. It is represented, through its chair, on the Australian Mathematical Sciences Council, on the steering committee of the Australian Mathematical Society and on the board of the Australian Mathematical Sciences Institute. Meetings were held with these groups during the year. The Committee made a submission to Government on behalf of the mathematical sciences (wwwmaths.anu.edu.au/other/ncms/block_funding.html).

Medicine

Chair: Professor Robert Williamson

The Committee did not meet during 2003. However, there were several issues involving medicine, and medical and health research, where Council took a position, and two where the Committee was involved.

On behalf of the Academy, the Committee presented a submission of views to the Investment Review of Health and Medical Research, a Government committee reviewing gains from the implementation of the Wills Report. We commented that the Government deserves every credit for implementing most of the recommendations of the Wills Report, as the increases in funding have enabled Australia to maintain some level of competitiveness in biomedical research internationally. This increase in funding should continue, until Australia is funding biomedical research to a comparable level to other OECD countries. The submission is available at www.science.org.au/natcoms/medicine-submission.rtf.

The Committee has supported the Academy, as a member of the Inter-Academy Panel, in urging the Australian Government to oppose a resolution at the United Nations that would have attempted to impose restrictions on stem cell research at variance with our national laws. The Committee will investigate this issue further during 2004 and make recommendations to the Academy's Executive Committee if necessary.

The Committee noted with pleasure that Professor Fiona Stanley was made Australian of the Year for 2003. She has been a constant and effective advocate for medical and health research.

Psychology

Chair: Professor Max Coltheart

The major activity of the previous Chair, Professor J Michael Innes, during the first half of 2003 was representing the Committee at meetings to commence the arrangements for the holding of the International Congress of Applied Psychology in Melbourne in 2010. A bid was successfully made at the last meeting of the Congress in Singapore in July 2002. The bid was jointly submitted by the Committee and the Australian Psychological Society. The Executive Committee of the International Association of Applied Psychology visited Melbourne in January 2003 to make a site visit and to finally decide on the venue. The choice of Melbourne was ratified at that meeting.

Radio Science

Chair: Dr Phil Wilkinson

The Committee focused on improving communications with Australian radio scientists during 2003. The principal outcome was a significantly enhanced website (www.ips.gov.au/IPSHosted/NCRS/). Using the already established mailing list, the very successful hardcopy *Directory of Australian Radio Science* was updated and made available on the Committee's website. A page on the Committee's website has been set up to advertise radio science meetings likely to be of interest to Australian scientists.

The Committee selected Hobart as the venue for the next Workshop on the Applications of Radio Science (WARS) Conference: WARS04. The Committee also sought and received International Union for Radio Science (URSI) mode A support for the conference. This moral support is granted only if the international character and scientific value of the meeting is ensured. Papers were sought under the two categories of information and research. A half-day special session will be devoted to papers and discussions on future major radio astronomy projects: LOFAR and SKA. Both these projects encompass a wide range of Committee interests, from signal processing to ionospheric corrections in LOFAR, including potential spin-off industrial and non-astronomical scientific outcomes. WARS offers an ideal venue to discuss these topics, given the wide representation across national radio science disciplines that the conference attracts.

Space Science

Chair: Professor Peter L Dyson

The Committee's annual meeting was held by telephone hook-up in December.

The International Association of Geomagnetism and Aeronomy (IAGA) held a General Assembly as part of the General Assembly of the International Union of Geodesy and Geophysics (IUGG) held in Japan in July.

At the Assembly, Dr Charles Barton was elected President of IAGA for 2003-2007 and Professor Iver Cairns was elected Chair of Division IV–Solar Wind and Interplanetary Field, for the same period. The Committee supported a bid, which was unfortunately unsuccessful, to hold the 2007 IUGG General Assembly in Melbourne.

An outstanding Australian space science achievement has been FedSat, which includes instruments that study solar-terrestrial physics, and which has successfully completed a year of operations in orbit. The FedSat project received a 2003 National Award for Engineering Excellence.

During the year the Committee provided comments on 'Strategic Directions for Australia's Antarctic Scientific Research Program 2004/05-2008/09', proposing changes to continue significant support of the space science research program being conducted at Australia's Antarctic stations.

The Committee also provided input and specific suggestions on how the Agreement between the Government and the European Space Agency might be enhanced to provide better opportunities for Australian scientists to participate in European space science missions.

Theory of Machines and Mechanisms

Chair: Dr Ross McAree

The Committee did not meet in full in 2003 but members met informally at various times and corresponded via email. The Committee's activities were in part curtailed by the postponement until April 2004 of the 11th International Federation for Theory of Machines and Mechanisms (IFToMM) World Congress, due to the SARS epidemic.

Committee members discussed plans for the establishment of a biennial meeting of Australasian engineers and scientists interested in mechanism and machine theory. It was originally planned to hold the first of these meeting in 2003 but we were unable to garner sufficient support to achieve this.

Associate Professor James Trevelyan was been elected to the Executive Council of ICSU's International Federation of Mechanism and Machine Theory (IFTOMM) for a four-year period from 2003-2007.

International Council for Science

The International Council for Science (ICSU) is a non-government organisation which was founded in 1931. It promotes scientific activity and brings together scientists from different disciplines and different countries. The Academy adheres, on Australia's behalf, to ICSU. It comprises 101 multi-disciplinary National Scientific Members, Associates and Observers (scientific research councils or science academies) and 27 international, single-discipline Scientific Unions. These provide a wide spectrum of scientific expertise, enabling members to address major international interdisciplinary issues which none could handle alone. ICSU also has 24 Scientific Associates.

ICSU's objectives are set out in its Statutes and Rules of Procedure, to which all Members and Associates of ICSU adhere. One of the fundamental principles of ICSU is that of the universality of science, which affirms the right and freedom of scientists to associate in international scientific activity without regard to such factors as citizenship, religion, creed, political stance, ethnic origin, race, colour, language, age or sex.

ICSU seeks to break the barriers of specialisation by initiating and coordinating major international interdisciplinary programs and by creating interdisciplinary bodies alone, or in partnership with others, which undertake activities and research programmes of interest to several members. A number of bodies set up within ICSU also address matters of common concern to all scientists, such as capacity building in science, environment and development, and the free conduct of science.

ICSU acts as a focus for the exchange of ideas and information and the development of standards. Hundreds of congresses, symposia and other scientific meetings are organised each year around the world, and a wide range of newsletters, handbooks and journals is published.

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 at www.science.org.au/internat/guidelines.htm.

The Academy, on behalf of the Australian research community, invited the International Association of Geodesy (IAG) to stage its Scientific Assembly in Cairns in 2005. This will be the first Joint Assembly of IAG, the International Association for Physical Sciences of the Oceans (IAPSO) and the International Association for Biological Oceanography (IABO). The International Union for Quaternary Research (INQUA) will hold its General Assembly in Cairns in 2007. The Academy has also invited the International Geological Congress (IGC) to stage the 34th Session of the International Geological Congress in Brisbane in 2012. The outcome of this bid is expected to be known later in 2004.

Delegates

The Academy appoints delegates to the business meetings of ICSU's bodies, after advice from the National Committees. Delegates for 2003 are listed here:

International Network on Human Rights 23-24 May, Ascona, Switzerland	Dr Derek Denton
International Union for Geodesy and Geophysics (IUGG) 30 June-11July, Sapporo, Japan	Dr Charles Barton Professor Brian Fraser
International Conference on Laser Spectroscopy (ICOLS) 13-16 July, Palm Cove, Queensland	Professor Gerard Milburn Professor Peter Hannaford
International Astronomy Union (IAU) 13-26 July, Sydney	Professor Rachel Webster Dr Phil Wilkinson Professor Penny Sackett
International Union of Biochemistry and Molecular Biology (IUBMB) Molecular Biology (IUBMB) 20-24 July, Toronto, Canada	Professor John Wallace Professor Phillip Nagley
International Union for Quaternary Research (INQUA) 21-30 July, Reno, USA	Professor John Dodson Dr Simon Haberle Dr Henk Heijnis
International Union for History and Philosophy of Science (IUPS) 7-13 August, Oviedo, Spain	Dr John Forge Dr Rachel Ankeny
International Union of Pure and Applied Chemistry (IUPAC) 8-15 August, Ottawa, Canada	Professor John Ralston Professor Bob Gilbert Professor David Black Professor Allan Canty Professor Mary Garson

Further information about ICSU is available at www.icsu.org.

Inter-Academy Panel on International Issues

The Inter-Academy Panel on International Issues (IAP), a global network of the world's national science academies, was launched in 1993. Its primary goal is to help member academies work together to advise citizens and public officials on the scientific aspects of critical global issues. It is particularly interested in assisting young and small academies to achieve these goals.

Further information about the IAP is available at www.interacademies.net.

In September the IAP issued a statement calling on the United Nations to adopt a ban on human reproductive cloning. In the same statement, however, the science academies indicated that therapeutic cloning should be exempt from the ban.

The Foreign Secretary, Professor Kurt Lambeck, represented the Academy at the IAP Executive Committee Meeting in Rome from 23-25 May and the General Assembly in Mexico City from 1-5 December. At the meeting in Mexico City, the IAP released statements on scientific capacity building, science education, science and the media, access to scientific information and mother and child health. The Academy has also provided input to the IAP on Australian science education for their website portal on this topic. The Academy's term on the Executive of this body expired at the end of 2003.

Bilateral activities

Bilateral activities provide opportunities for Academy officials and government officials to meet with high-level international researchers and research funders, to discuss international science and technology policy and practices, and to promote Australian research and technology.

Meetings between Academy representatives and their international counterparts provide an opportunity to discuss the operation of a particular program and make necessary modifications to ensure a program is meeting its objective.

A large portion of the Academy's bilateral activities are funded as part of the Department of Education, Science and Training's International Science and Technology Networks, a component of the Innovation Access Program.

In 2003 the Academy hosted the visits by the President of the Chinese Academy of Sciences, the Chairman of the Korea Science and Engineering Foundation (KOSEF) and the Chairman of the National Science Council of Taiwan. The Head of the Research Cooperation Division of the Japan Society for the Promotion of Science also visited the Academy.

Asia

China

The President of the Chinese Academy of Sciences and Vice Chairman of the Standing Committee of the National People's Congress of the People's Republic of China, Professor Yongxiang Lu, visited Australia between 9 and 15 November.

From left: Dr Brendan Nelson, Professor Kurt Lambeck and Professor Lu Yongxiang.

While in Australia, Professor Lu formally opened the joint laboratory of Soil Biology/Soil Environmental Science of the University of Adelaide (Waite Campus) and the Research Centre for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing. He attended a signing ceremony to renew an agreement between the University of Melbourne and the Chinese Academy, and signed an agreement relating to an AusAID/ACIAR-supported project with the Chinese Academy, Tibet Bureau of Agriculture and Animal Husbandry, Tibet Academy of Agricultural and Animal Sciences and CSIRO Sustainable Ecosystems.

The Foreign Secretary, Professor Kurt Lambeck, hosted a working lunch and a formal dinner at the Academy for Professor Lu on 13 November. The Governor-General, Major-General Michael Jeffery, and Mrs Marlena Jeffery, attended the dinner. Prior to the dinner the Hon. Dr Brendan Nelson MP, Minister for Education, Science and Training, met with Professor Lu at Ian Potter House.

Japan

The Academy hosted a working lunch on 21 May for Mrs Yuko Furukawa, Head of the Research Cooperation Division of the Japan Society for the Promotion of Science (JSPS), to discuss activities between the Academy and JSPS. The Academy and JSPS have had a bilateral exchange program for many years and JSPS also funds Invitational and Postdoctoral Fellowships annually.

Korea

The Foreign Secretary hosted a working lunch on 11 November for Dr Chung-Duk Kim, the Chairman of the Korea Science and Engineering Foundation (KOSEF), to discuss the cooperative programs with the Academy. Dr Kim was in Australia to explore the possibility of further promoting scientific cooperation with counterpart organisations, and to get an overview of research activities in Australia.

In the evening, the Foreign Secretary and Dr Peter Cook, Foreign Secretary of the Academy of Technological Sciences and Engineering, hosted a small dinner for Dr Kim and members of his delegation, Mr Byung-Whan Ho, Director of International Programs, and Ms Eunhee Hwang, Program Manager.

Academy President, Dr Jim Peacock, attended the opening of the new building for the Korean Academy of Science and Technology (KAST) on 19 November and presented a paper at the 2003 KAST Multilateral Conference entitled 'Science and the transformation of agriculture–improving health and quality of life'.

Taiwan

Dr Che-Ho Wei, Minister for Science and Chairman of the National Science Council of Taiwan (NSC), visited Australia from 19 to 21 August to officially open the S&T Division of the Taipei Economic and Cultural Office (TECO), and the Australia–Taiwan Food Biotechnology Workshop in Sydney. The Academy together with the Academy of Technological Sciences and Engineering hosted a dinner in Canberra for Dr Wei and his delegation on 19 August.

On 10 October, Professor Brian Kennett, Chair of the Academy's Asia and Postdoctoral Exchange Committees, met with Dr Kuan-Ching Lee, Counsellor, Science and Technology Division of TECO, Professor Huang Yang from the National Science Council and Professor Wen-Hsien Li, Department of Physics, National Central University of Taiwan. Professor Kennett and the Taiwanese delegation discussed research activities between Australia and Taiwan, particularly in the area of physical sciences.

Democratic People's Republic of Korea

The Ambassador of the Democratic People's Republic of Korea, Mr Jae Hong Chon, met with the Foreign Secretary on 16 October at the Academy to discuss the activities of the Academy and the possibility of a future exchange program between Australia and North Korea.

Malaysia

The Foreign Secretary met with Professor Hoong Fong Chin, Fellow of the Academy of Sciences Malaysia, on 25 March, to discuss matters of mutual interest. Professor Chin is an Honorary Fellow of the Malaysian International Plant Genetic Resources Institute and also visited CSIRO and ACIAR while in Australia.

Europe

Academies of Finland

The Foreign Secretary visited the Academy of Finland, the equivalent of the ARC, and the Finnish Academy of Science and Letters, in Helsinki in May. At the Academy of Finland (AoF) he met with key senior research advisors as well as the Head of International Relations. The AoF is responsible for the establishment of centres of excellence and the development of collaboration between institutions both within Finland and Europe. It has participated in the two international conferences organised by the Forum for European-Australian Science and Technology Cooperation (FEAST) which were held in Canberra in 2001 and 2003. At the Finnish Academy of Science and Letters, the Foreign Secretary met with the Secretary-General, Professor Matti Saarnisto, to discuss the activities of both Academies.

Polish Academy of Sciences

On behalf of the Polish Academy of Sciences, Dr Janina Wisniewska from the Polish Geological Institute, visited the Academy on 11 August. Dr Wisniewska sought to discuss the possibility of Australian-Polish research collaboration through the Academies. She was in Australia visiting various geological sites and was accompanied by Professor Bruce Chappell, who was hosting her visit to Macquarie University.

French Academy of Sciences

The Foreign Secretary met with Professor Gérard Siclet of the French Academy of Sciences on 10 November to discuss French-Australian relations and matters relating to the International Council for Science (ICSU). Professor Siclet was in Canberra to attend the FEAST 4 conference. Academy President, Dr Jim Peacock, also met with Professor Siclet on 11 November to discuss matters related to International Scientific Unions.

From left: Professor Johannes Kabatek (Professor of Linguistics, Freiburg University), Ms Ulrika Holdefleib-Walter (Alexander von Humboldt Foundation), Professor Rainer Birringer (Chair of Engineering and Applied Science, Saarland University), Professor Wolfgang Frühwald, Professor Kurt Lambeck, Mr Jost-Gert Glombitza (Director of the Division of International Cooperation, Deutsche Forschungsgemeinschaft), and Dr Gerrit Limberg (Alexander von Humboldt Foundation).

Germany

The Academy hosted a German-Australian Forum on 1 March. At the Forum, which was chaired by Professor Wolfgang Frühwald, President of the Alexander von Humboldt Foundation, and the Chief Scientist, Dr Robin Batterham, Australian scientists spoke about their experiences in their bilateral cooperation and German researchers talked about future developments and new ways of promoting cooperation. A number of Humboldt Fellows resident in Canberra were also invited to the Forum. During his visit to Australia, Professor Frühwald and his delegation visited the Australian National University, the University of New South Wales and the University of Sydney.

United States

The US National Science Foundation (NSF) advertised its Summer Program in Australia for US graduate students in science and engineering in September. NSF has revised the program name to include 'Pacific', giving Australia a special place in the list of eligible countries. The program is now known as the East Asia and Pacific Summer Institutes for US Graduate Students.

The program will last eight weeks, from June/July to August, and will allow 20 US students to travel to Australia to conduct research in laboratories and to initiate personal relationships with their Australian counterparts. The inaugural summer program will commence in Canberra on 23 June 2004.

Dr Michael Barber, Secretary, Science Policy, visited the NSF headquarters in Washington DC on 2 March. He gave an informal talk to staff about Australia's National Research Priorities, Australia's research funding system, and the role and activities of CSIRO.

Other international activities

The Sir Mark Oliphant International Frontiers of Science and Technology Conference Series

This conference series provides financial support for the staging of strategically significant international conferences in Australia on high priority, cutting edge, multi-disciplinary themes. The Academy, the Academy of Technological Sciences and Engineering, and the Institution of Engineers, Australia, organise the conferences. The conference series is supported by the Department of Education, Science and Training, under the Innovation Access Program.

Two conferences were held in the past year: 'Proteomics: Progress, Partnerships and New Directions' at the University of Sydney in November, and 'Scaling Down to a Nano-material World: Key Challenges Facing 21st Century Scientists and Engineers' at the University of Melbourne in December.

Forum for European-Australian Science and Technology Cooperation

The European Union is Australia's largest scientific partner, mainly through bilateral collaboration, but also through multilateral projects. The diplomatic missions representing the Member States of the European Union and the European Commission in Australia, in association with major Australian science and technology organisations, including the Academy, have embarked on a common action to highlight and improve this cooperation. This initiative is known as the Forum for European-Australian Science and Technology cooperation (FEAST).

From left: Alain Moulet, Patrick Henault, Peter McGauran and Kurt Lambeck at the signing of the French-Australian Science and Technology Program.

Professor Neville Fletcher is the Academy's representative on the FEAST Board and has attended monthly meetings held at the Embassies of Greece, Italy and Ireland, and the office of the European Commission.

The Foreign Secretary welcomed the Minister for Science, the Hon. Peter McGauran MP, His Excellency Mr Patrick Henault, Ambassador of France in Australia, and Alain Moulet, Attaché Science and Technology, Embassy of France, to the Academy on 12 November for the national

launch of FEAST-France and the signing of a new French-Australian Science and Technology program.

The FEAST 'Networking for Excellence Conference' on world-leading research and the importance of networking, was held at the Shine Dome and the Australian National University in November. The conference, the fourth in a series of events organised by FEAST to promote Australian-European research collaboration, provided researchers, research managers and policy-makers with an ideal opportunity to explore research activities and major drivers impacting on international research collaboration. The Academy sponsored three early-career researchers to attend the event.

Science, Engineering and Technology Network (SETnet)

The Academy is a supporter of SETnet, which aims to provide an informal network for foreign governments, Australian researchers and those involved in science policy to exchange information and ideas. During the year SETnet organised a series of lectures with Australian scientists who are conducting leading-edge research. The Academy hosted a SETnet meeting in June, in conjunction with the Federation of Australian Scientific and Technological Societies (FASTS) on the US Congressional Science Fellows Program. Dr Danny Wedding and Dr Jeff Payne, working scientists who have spent 12 months posted to Congress advising US politicians on science issues, were the speakers. Professor Neville Fletcher spoke about his work on the physics of musical instruments and Professor Jenny Graves spoke about research into marsupial chromosomes and DNA at a SETnet meeting in December.

Diplomatic missions

The Academy maintains regular links with a number of counsellors and scientific attachés in Australia's embassies. In the same way it maintains fruitful relations with foreign embassies in Canberra, including the Embassies of France, Italy, China, Japan, Korea and Taiwan, in relation to its exchange programs of scientists. For example, the French Embassy has for many years supported the visits of Australian researchers to France, and last year it was able to extend this support to five Australian researchers.

Support for international collaborations

The objectives of the Academy's program of international scientific and technological collaborations are to improve Australian access to science and technology and to increase awareness of Australian research.

The Academy's program gives Australian researchers the opportunity to collaborate with foreign colleagues, to widen research perspectives and experience, to exchange ideas, to be recognised in the international arena, to gain information and knowledge of techniques that will stimulate and advance Australian research, and to be involved in large international projects.

Full details of all programs are available at www.science.org.au/internat/exchange/contscix.htm.

The Academy's international programs are structured into four sections: short-term visits to Europe, North America and Asia; and long-term postdoctoral fellowships. The programs support collaborative research between professional Australian scientists and technologists and their colleagues in Europe, Korea, China, Japan, Taiwan, United States of America, Canada and Mexico. The Academy also administers postdoctoral fellowships with Japan and Korea. The programs provide funds for living and travelling costs.

The programs are funded as part of the Department of Education, Science and Training's International Science and Technology Networks (ISTN), a component of the Innovation Access Program.

The following researchers were supported in 2003:

Europe

Researcher	Project	Host institution
Dr Gabrielle Belz Walter and Eliza Hall Institute of Medical Research	Mechanisms of g-herpesvirus lymphoid colonisation and immune control *in vivo*.	Dr Stacey Efstathiou University of Cambridge, UK
Dr Iver Cairns University of Sydney	Confronting theory with Cluster II Spacecraft observations of plasma waves in Earth's foreshock.	Dr Vladamir Krasnosel'skikh Centre National de la Recherche Scientifique, France
Dr Margaret Faedo Prince of Wales Hospital, University of New South Wales	The prevalence of Mouse Mammary Tumour Virus (MMTV)–like DNA sequences in hormone dependent cancers.	Dr Massimo Tommasino WHO International Agency for Research on Cancer, France
Dr Kosmas Galatsis RMIT University	Room temperature ozone monitoring with metal oxide gas sensors.	Professor George Kiriakidis Foundation for Research and Technology, Hellas, Greece
Professor Eugene Gamaly Australian National University	Ultra-short laser-matter interaction: controlling over the phase changes and ablation.	Professor Marc Sentis Centre National de la Recherche Scientifique, France
Associate Professor Robin Gasser University of Melbourne	*Caenorhabditis elegans* – a unique platform for testing the functions of gene homologues from parasitic nematodes of socio-economic importance.	Professor Alex Hajnal University of Zurich, Switzerland
Professor Philip Kuchel University of Sydney	NMR of quadrupolar nuclei in cellular environments.	Professor Norbert Mueller Johannes Kepler Universitat, Austria
Dr Zdenka Kuncic University of Sydney	Supermassive black holes in active galaxies: New clues from X-ray observations.	Dr Kinwah Wu University College London, UK
Dr Serdar Kuyucak Australian National University	Computational studies of ion channels.	Professor Artur Baumgaertner Forschungzentrum Juelich, Germany
Dr Geraint Lewis University of Sydney	The Andromeda Stream.	Dr Rodrigo Ibata Observatoire Astronomique, France
Dr Zhongyi Li CSIRO Plant Industry	Targeted gene silencing in Chlamydomonas to alter starch quality.	Professor Steven Ball Centre National de la Recherche Scientifique, France
Dr Qian Ma University of Queensland	Understanding the solidification of a new generation of automotive magnesium engine block.	Professor Jacques Lacaze Centre Inter Universitaire de Recherche et d'Ingénnierie des Matériaux, France
Dr Stephen McLoughlin Queensland University of Technology	Sedimentology and plant microfossil assemblages across the Cretaceous-Tertiary mass-extinction event in Belize.	Dr Vivi Vajda University of Lund, Sweden

Researcher	Project	Host institution
Associate Professor Ross McMurtrie University of New South Wales	Environmental sustainability of intensively managed, short-rotation forestry.	Dr Jean-Pierre Bouillet CIRAD Foret, France
Dr Shahar Mendelson Australian National University	On the supremum of gaussian and empirical processes.	Dr Alain Pajor Université de Marne-la-Valleé, France
Associate Professor Sandra Rees University of Melbourne	A primate model of premature birth: Pattern of cerebral development and injury in the infant baboon.	Dr Pierre Gressens Hopital Robert-Debré, France
Dr Samantha Richardson University of Melbourne	Uptake and distribution of thyroid hormones in chicken brains.	Professor Veerle Darras Katholieke Universiteit Leuven, Belgium
Dr Suzanne Smith Australian Nuclear Science and Technology Organisation	Molecular imaging with Copper-64.	Dr John Clarke University of Cambridge, UK
Dr Kerrie Swadling University of Tasmania	Local and regional patterns of Antarctic planktonic fauna: factors influencing their distribution in the coastal sea-ice zone.	Professor Philippe Koubbi Université du Littoral Côte d'Opale, France
Dr Russell Varley CSIRO Molecular Science	Understanding the improved performance of nanostructured polymer matrices in advanced composite materials.	Assistant Professor Marino Quaresimin Universitá di Padova, Italy

Asia

China Exchange

Researcher	Project	Host institution
Dr Philip Charlesworth CSIRO Land and Water	Investigation of irrigation management to protect groundwater resources from sea water intrusion and nutrient leaching.	Associate Professor Jiannan Zhou Chinese Academy of Tropical Agricultural Sciences
Dr Bin Gong University of New South Wales	Electron spectroscopy investigation of novel nanometer magnetic thin film materials.	Professor Zhi-dong Zhang Institute of Metal Research, Academia Sinica
Professor John Morrison University of Wollongong	Absorption processes in the mitigation of coastal algal blooms.	Dr Zhiming Yu Institute of Oceanography, Chinese Academy of Sciences
Dr Shaobin Wang Curtin University of Technology	Utilisation of carbon dioxide for selective oxidation of methane and lower hydrocarbons to olefins.	Dr Longya Xu Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Dr Weijin Wang Queensland Department of Natural Resources and Environment	Automatic systems for measuring greenhouse gas fluxes in terrestrial ecosystems.	Dr Yuesi Wang Institute of Atmospheric Physics, Chinese Academy of Sciences
Dr Simon Wilde Curtin University of Technology	Resolving catastrophic events beneath north-east China during the late Mesozoic.	Professor Fuyuan Wu Institute of Geology & Geophysics, Chinese Academy of Sciences

Korea Exchange

Researcher	Project	Host institution
Dr Rafael Calvo University of Sydney	Cluster computing for multilingual document classification.	Professor Jae-Moon Lee Hansung University
Dr Evan Christen CSIRO Land and Water	Modelling drainage water quality from irrigated areas.	Professor Sang-Ok Chung Kyungpook National University
Dr Stephen Kwok University of New South Wales	Role of amyloid precursors in age-related cataractogenesis.	Dr Choun-Ki Joo Catholic University Korea
Dr Phillip Pendleton University of South Australia	Controlled-growth of inorganic oxide nanoparticles in porous networks.	Professor Ju Chang-sik Pukyong National University
Professor Bruce Stone La Trobe University	Enhanced curdlan production by mutant strains of *Agrobacterium.*	Dr Eui-Sung Choi Korea Institute of Bioscience and Biotechnology
Dr Stephen Trueman Queensland Forestry Research Institute	Uptake of somatic embryo biotechnology for producing elite forestry pines.	Professor Young-Goo Park Kyungpook National University
Dr Calum Wilson Tasmanian Institute of Agricultural Research	Molecular basis of thaxtomin toxicity in plant cells, and strain differentiation of the common scab pathogen.	Associate Professor Chun Lim Kangwon National University
Dr Chao Zhang University of Wollongong	Magnetoresistance in semiconductor nanostructures under intense electromagnetic radiation.	Professor Jongbae Hong Seoul National University

Taiwan Exchange

Researcher	Project	Host institution
Dr Hung-Yao Hsu University of South Australia	Design-for-assembly of a precision probe for nano-coordinate measurement machines.	Professor Kuang-Chao Fan National Taiwan University
Dr Prabhu Manyem University of South Australia	Modelling manufacturing networks with generalised network flows.	Professor Ruey-Lin Sheu National Cheng-Kung University
Dr Mary She University of South Australia	Characterisation of filtration membrane morphology with image analysis.	Associate Professor Allan Tung Chung Yuan University

Japan Society for the Promotion of Science bilateral programs

Researcher	Project	Host institution
Dr Graeme Allinson Deakin University	Measurement of chemical contamination of north-south migratory sea birds.	Dr Masatoshi Morita National Institute for Environmental Studies, Tsukuba
Dr Dennis Arnold Queensland University of Technology	Surface imaging of organometallic porphyrin arrays.	Associate Professor Ken-ichi Sugiura Tokyo Metropolitan University
Professor Bruce Auld Orange Agricultural Institute	Resisting invasive plant species.	Dr Hirohiko Morita National Agricultural Research Centre for Kyushu

Researcher	Project	Host institution
Dr Alecia Bellgrove Deakin University	Using FTIR microspectroscopy to differentiate marine algal dispersal potential.	Dr Masakazu Aoki University of Tsukuba
Dr John Donald Deakin University	Osmoregulation in an Australian desert rodent.	Professor Yoshio Takei University of Tokyo
Dr Nazrul Islam CSIRO Entomology	Risk of transgenic organisms: quantification by proteomic approaches.	Professor Hishashi Hirano Yokohama City University
Dr Chunlu Liu Deakin University	Technological development for post-construction management.	Professor Yoshito Itoh Nagoya University
Dr Marian Radny University of Newcastle	Theoretical (computational) studies of silicon-based nanostructures.	Dr Akihisa Inoue Tohoku University
Dr Andrey Sukhorukov Australian National University	Self-induced optical waveguides.	Professor Satoshi Kawata Osaka University

Europe

Young Australian Researchers Program

Researcher	Project	Host institution
Mr Warwick Bowen Australian National University	Quantum spatial modes and their use in imaging, measurement and communication.	Professor Claude Fabre Université Pierre et Marie Curie, France
Dr Christopher Chambers University of Melbourne	Exploring the link between genetics and behaviour in attention deficit hyperactivity disorder.	Professor Ian Robertson Trinity College, Ireland
Dr James Chon Swinburne University of Technology	Two-photon excited blinking properties of semiconductor nanocrystal quantum dots under the presence of elctron-acceptor impurities.	Professor Michael Orrit Universiteit Leiden, Netherlands
Mr Francis Clark University of Queensland	Computational study of sequence regulatory elements in alternative gene splicing.	Dr T A Thanaraj European Bioinformatics Institute, UK
Dr Mathew Cook CSIRO Marine Research	Microarray analysis of differentially expressed immune genes in relation to amoebic gill disease (AGD) infection in cultured Atlantic salmon (*Salmo salar*).	Dr Bjorn Hoyheim The Norwegian School, Norway
Mr Joe Coventry Australian National University	High efficiency, low cost concentrating photovoltaic solar collectors.	Professor Guiliano Martinelli University of Ferrara, Italy
Mr Greg Dutkowski University of Tasmania	Testing approaches for the simple prediction of breeding values in forest trees across progeny trials with heterogeneous variances.	Dr Tore Ericcson Skogforsk, Sweden

Researcher	Project	Host institution
Dr Bryan Fry University of Melbourne	Toxinformatics: The molecular evolution of snake venom proteins from 'Genome to Venome'.	Dr Minna Lehvaslaiho European Bioinformatics Institute, UK
Mr Thomas Headley Southern Cross University	State-of-art constructed wetland technologies for the ecological-based treatment of wastewater–an emphasis on cutting-edge technological developments and enhancing our understanding of the key processes.	Professor Hans Brix University of Aarhus, Denmark
Ms Kate Jeffrey Garvan Institute of Medical Research	The role of PAC-1 in rheumatoid arthritis.	Dr Monteserrat Camps Serono Pharmaceutical Research Institute, Switzerland
Mr Mark McDonnell University of Adelaide	Suprathreshold stochastic resonance, its role in neural coding, and its application to cochlear implant encoding and biologically inspired electronic sensing devices.	Dr Nigel Stocks University of Warwick, UK
Ms Freya Mearns University of New South Wales	DNA biosensors with dual (electrochemical and optical) monitoring capabilities.	Dr Sabine Szuneritz Centre National de la Recherche Scientifique, France
Mr Samuel Mickan University of Adelaide	High-resolution T-ray imaging of cancer cells.	Dr Peter Jepsen University of Freiburg, Germany
Ms Kate Nixon Flinders University	Triple coincidence (e,3e) 'complete' experiments for double ionisation.	Professor Azzedine Lahmam-Bennani Université Paris-Sud, France
Mr Nicholas Robins Australian National University	The continuous atom laser.	Gerhard Birkl University of Hannover, Germany
Dr Helena Sim Prince Henry's Institute of Medical Research	Human sex determination and intersex disorders.	Dr Francis Poulat Centre National de la Recherche Scientifique, France
Mr Orson Sutherland Australian National University	Parametric decay in space propulsion systems.	Dr Pascal Chabert Ecole Polytechnique, France

USA

Young Australian Researchers Program

Researcher	Project	Host institution
Ms Janice Abbey Australian National University	Expression of germline TCR-V – transcripts in early hematopoietic progenitors: defining the role of these markers in lineage.	Dr Irving Weissman Stanford University
Dr Tristram Alexander Australian National University	Optical vortices in nonlinear photonic lattices.	Professor Zhigang Chen San Francisco State University

Researcher	Project	Host institution
Mr Stuart Archer Australian National University	Identification of interactors for the Flightless I protein and its ligand FLAP by co-immunoprecipitation of epitope-tagged fusion proteins.	Professor Michael Stallcup University of Southern California
Ms Lisa-Marie Atkin University of Queensland	Use of in vivo magnetic resonance and isotopic tracer technology to investigate the pathophysiology of metabolic syndrome.	Associate Professor Gary Cline Yale University
Ms Karin Beaumont Australian Antarctic Division	Determining the contribution by zooplankton to vertical carbon flux and the implications for global climate change.	Associate Professor Juanita Urban-Rich University of Massachusetts Amherst
Dr Nicholas Cavenagh University of Queensland	Algebraic security in binary operation tables.	Professor Saad El-Zanati Illinois State University
Dr Jun Chen University of Wollongong	Electrochemistry of inherently conducting polymer modified aligned carbon nanotubes.	Associate Professor Liming Dai University of Akron
Dr Paula Cisternas University of Sydney	Evolution of development and speciation in the *Ophiuroidea*.	Dr David Epel Hopkins Marine Station, Stanford University
Mr Matthew Hall University of Sydney	Effects of biologically relevant metal ions on mitochondrial oxygen consumption.	Professor James Dabrowiak Syracuse University
Dr Dustin Marshall University of New South Wales	Examination of the effects of offspring size on adult competition in colonial marine invertebrates.	Professor Richard Emlet University of Oregon
Mr Ben Muir CSIRO Molecular Science	ToF-SIMS analysis of plasma polymer thin films.	Dr David Castner University of Washington
Dr David O'Connor University of Sydney	The evolution of reptile sociality.	Associate Professor Robert Miller University of New Mexico
Mr William Robbins James Cook University	Genetic stock structure of the whitetip reef shark (*Triaenodon obesus*) across the Pacific.	Professor Brian Bowen University of Hawaii
Mr Andrew Rose University of New South Wales	Manipulation of iron specification in sea water by *Trichodesmium*.	Assistant Professor Judy O'Neil University of Maryland
Ms Michelle Sait University of Melbourne	Sequencing the genomes of environmentally important bacteria.	Dr Cheryl Kuske Los Alamos National Laboratory
Ms Jessica Stapley Australian National University	Do individuals of the invasive mosquitofish, *Gambusia affinis*, from native and invaded populations differ in their dispersal tendencies?	Dr Andy Sih University of California

Lectures and medals–2004

Central to the purposes of the Academy is the encouragement of excellence in science. Awards for distinguished research are made to younger researchers, under the age of 40, and to senior researchers for contributions made during their working lives.

Senior award recipients

The David Craig Medal for research in chemistry

Professor Alan Bond, Monash University, for research in electrochemistry and electron transfer reactions.

The Hannan Medal for research in pure mathematics

Professor Hyam Rubinstein, University of Melbourne, for research in low dimensional topology.

The Mawson Medal and Lecture for research in the Earth sciences

Professor Michael Sandiford, University of Melbourne, for research in the geodynamic evolution of the continents.

Junior award recipients

The Dorothy Hill Award for research by a female in the Earth sciences

Dr Susan Wijffels, CSIRO Marine Research, Hobart, for research in oceanography.

The Fenner Medal for research in biology, excluding the biomedical sciences

Dr Gregory Edgecombe, The Australian Museum, Sydney, for research on Arthropoda.

The Frederick White Prize for research in the physical, terrestrial and planetary sciences

Dr Matthew England, University of New South Wales, for research in oceanographic modelling.

The Gottschalk Medal for research in the medical sciences

Associate Professor Melissa Little, University of Queensland, for research in human molecular genetics.

The Le Fèvre Prize for research in chemistry

Dr Cameron Kepert, University of Sydney, for research in materials chemistry.

The Pawsey Medal for research in physics

Professor Marcela Bilek, University of Sydney, for research in vacuum arc plasma physics.

More information on awards is available at www.science.org.au/awards.

Research support and lectureships

The Academy provides funding for the support of individual research projects and for lectureships. The purpose of the lectureships is to enable distinguished researchers to communicate with Australian researchers and, through public lectures, to a broader audience.

The Fund for the Conservation of Endangered Vertebrate Species supports research on endangered Australian vertebrate species

- Mr Matt Morgan, Australian National University, for research on northern and southern corroboree frogs.
- Dr Jane Melville, Museum Victoria, for research on earless dragons.

The Maxwell Ralph Jacobs Awards support projects in forestry research

- Ms Anna Smith, CRC for Sustainable Production Forestry, for travel to South Africa for research on the effects of *Mycosphaerella nubilosa* on *Eucalyptus nitens.*
- Ms Julianne O'Reilly-Wapstra, CRC Sustainable Production Forestry, for travel to Scotland for research into natural plant resistance to herbivores.

The J G Russell Awards support young researchers in basic science

- Dr Sean Connell, University of Adelaide, for research on local and regional investigations into perturbations of marine habitat.
- Dr Naomi Langmore, School of Botany and Zoology, Australian National University, for research on cuckoo parasitism and host defences in Australia.
- Dr Michael Monteiro, University of Sydney, for research on the synthesis of nanocomposite polymers with targeted properties.
- Dr Christian Turney, University of Wollongong, for research on radiocarbon dating frontiers: Testing hypotheses of human evolution and environmental change in Australasia and south-east Asia (60,000-25,000 years ago).

The Graeme Caughley Fellowship supports ecologists resident in Australia or New Zealand to share their expertise by visiting scientific centres and giving lectures in countries other than Australia or New Zealand

- Professor Richard Shine, University of Sydney, to visit North America to partake in workshops and conferences on the ecology of reptiles.

The Rudi Lemberg Fellowships are awarded to overseas and Australian scientists to visit scientific centres in Australia and to deliver lectures.

- Professor Charles Dismukes, Department of Chemistry, Princeton University, to visit Canberra, Brisbane, Sydney, Melbourne and Adelaide.

The Selby Fellowships are awarded to overseas scientists to visit scientific centres in Australia and to deliver lectures

- Professor David Pritchard, Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, who visited Melbourne, Canberra, Sydney and Brisbane in February and March.

The Lloyd Rees Lecture supports distinguished researchers in chemical physics

- Professor Peter Hannaford, Swinburne University of Technology, will present the Lloyd Rees Lecture in September 2004 to mark the 50th Anniversary of the first atomic absorption spectrophotometer, which was conceived and developed by the late Sir Alan Walsh.

The Wallace Gentle Scholarship Fund supports postgraduate study in forestry science

- Mr Bevan McBeth, Southern Cross University, Lismore, to undertake a PhD.

The Frew Fellowship is awarded to overseas scientists to participate in the Australian Spectroscopy Conferences

- Professor W E Moerner, Stanford University, USA, who attended the Optics, Lasers and Spectroscopy Conference in Melbourne in December.

Research conferences

The Academy supports research conferences which are organised by scientific societies to bring together researchers at the forefront of particular subjects to discuss contemporary scientific topics. Conferences supported in 2004 include:

The Boden Research Conferences support researchers in the biological sciences

- The Australian Neuroscience Society, for a conference on *Visual cortex: a variety of viewpoints*, Melbourne, 26-27 January 2004.
- The Australasian Society for Immunology, for a conference on the topic NKTOZ–the 3rd international NKT Cell and CDI Workshop, to be held on Heron Island, Queensland, 8-13 September 2004.

The Elizabeth and Frederick White Conferences support researchers in the physical and mathematical sciences

- The Research School of Astronomy and Astrophysics and the Research School of Earth Sciences at the Australian National University, for a conference on *Planetary timescales: stardust to continents*, Canberra, 16-17 February 2004.

The Fenner Conferences on the Environment support researchers and policy advisers in the areas of environment and conservation affecting Australia and its environs

- The Population and Environment Committee of the Australian Academy of Science, for a conference on *Understanding the population-environment debate: Bridging disciplinary divides*, to be held in Canberra, 24-25 May 2004.
- The CSIRO Centre for Environment and Life Sciences, Western Australia, for a conference on *Adaptation of plants to water-limited Mediterranean-type environments*, to be held 20-24 September 2004.
- The National Centre for Epidemiology and Population Health, Australian National University, for a conference on *The urban environment and human health: Conditions and prospects* (date to be confirmed).

Science education and public awareness

More information on science education is available at www.science.org.au/scied.

The Academy is committed to promoting science education, both as a contribution to informed citizenship and to encourage our young people to prepare themselves for careers based on science and technology. To this end, the Academy has contributed to the formulation of policy for science education and prepared teaching resources for all levels of school science. The following is an overview of our current activities.

Australian Foundation for Science

The Academy established the Australian Foundation for Science in 1990 as the fundraising arm of the Academy, with a particular focus on science and technology education and public awareness. As a separate company limited by guarantee, a Board of Directors has overseen the Foundation's activities and formal reporting on projects has taken place at an annual general meeting. This year the Foundation was wound up as a separate company and incorporated as a recognisable entity under the Academy. This streamlining has removed administrative complexities while allowing the Foundation's projects to continue unchanged. An Advisors' Committee will continue to provide ideas for the Foundation's activities and reporting on projects will occur at an annual Open Session.

Primary Investigations

www.science.org.au/pi

Primary Investigations is the Academy's science and technology program for primary schools. The program is designed to stimulate hands-on, enquiry-based learning and consists of teacher resource books, student books, inservice training for teachers, a 'do-it-yourself ' inservice video and workbook, and a website. The program continues to be used in schools around Australia.

Primary Science and Literacy Project

The Primary Science and Literacy Project team. From left: Associate Professor Vaughan Prain, Marian Heard, Professor John McKenzie, Jean Watson, and Professor Mark Hackling.

The Academy has embarked on the first stage of a collaborative national project to link the teaching of science with the teaching of literacy in primary schools. This follows a decision in August by the Board of Directors of the Australian Foundation for Science to fund the first stage of the project. The Commonwealth Government, all State and Territory education jurisdictions, the National Catholic Education Commission, the Independent Schools Council of Australia, the Australian Science Teachers Association, the Australian Literacy Educators Association and the Primary English Teaching Association have all nominated representatives for the Reference Group.

Discussions with the State and Territory education jurisdictions have been very positive. A meeting of the Reference Group was held at the Shine

Dome in early December, with the group agreeing that the project will meet a real need in Australian primary schools. The group also agreed on the principles that should guide the project. In line with these guiding principles, a model for a professional learning program for teachers and a rich curriculum resource is currently under development.

Nova: Science in the news

www.science.org.au/nova

In May 2003, the newly formed Commonwealth Bank Foundation announced a three-year agreement as the principal sponsor of the Academy's educational website, *Nova: Science in the news*. The Foundation replaces Telstra Corporation Limited, *Nova*'s principal sponsor for the previous three years.

Nova is held in high regard by teachers and students and continues to grow in popularity. A major drawcard regularly cited by users is the Academy's guarantee that information on the site is accurate and up-to-date.

Nova topics continue to cover contemporary science issues, including coral bleaching, salinity, nanoscience and stem cells. The science of road safety has again been highlighted with the addition of a seventh topic–'Bogged down in the four-wheel drive debate?'–to the road safety series sponsored by the NRMA–ACT Road Safety Trust.

From left: John Ralph (Chair of the Australian Foundation for Science), Professor John McKenzie (Secretary, Education and Public Awareness) and Dr Jim Peacock at the announcement of the Commonwealth Bank Foundation's sponsorship of *Nova*.

Video biographies

www.science.org.au/scientists

The Academy established this ongoing series of interviews with outstanding Australian scientists in 1993. In the interviews scientists talk about their early life, the development of their interest in science, their research work and other aspects of their careers.

To date 85 interviews have been completed. Edited transcripts of the interviews, together with accompanying teachers notes, are being added progressively to the Academy's website. Feedback from teachers and education organisations continues to be very positive.

The project has been supported by the Commonwealth Government, the National Council for the Centenary of Federation, the Mazda Foundation and the Australian Research Council. Professor Frank Fenner has given ongoing support for this project both as sponsor and by conducting a number of the interviews. The current focus is on interviewing Academy Fellows.

All interviews in the series are available for loan or purchase from the Academy.

Ethnomathematics project

The Academy's contract with the US-based Pacific Resources for Education and Learning (PREL) to assist in developing an ethnomathematics digital library was completed in September. The digital library provides users with a readily accessible source of documents describing the mathematics created and used by indigenous cultures around the world.

The Academy's responsibility involved locating documents which relate to Aboriginal mathematics. Appropriate material available on the internet was selected and entered into PREL's database. The Academy then worked with the Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) to select and digitise relevant printed material from their library. The digitised material is available on the AIATSIS website at www.aiatsis.gov.au/lbry/dig_prgm/ethnomathmatics/ethno_hm.htm. It can also be accessed through PREL's ethnomathematics website at www.ethnomath.org.

Support for young researchers and science teachers

Teachers and early-career researchers from around Australia attended special programs during the Academy's *Science at the Shine Dome* conference from 30 April to 2 May 2003. They joined Academy Fellows at the New Fellows Seminar, awards presentation, annual dinner and the annual symposium, 'Nanoscience–where physics, chemistry and biology collide'.

From left: Dr David Vaux, the Hon. Peter McGauran MP, and Dr Andreas Strasser at the Academy's annual dinner. Mr McGauran was the after-dinner speaker.

The Academy sponsored awards for a teacher from each State and Territory to attend and, for the sixth year, the State, Catholic and independent school systems in every State and Territory sponsored classroom science teachers and curriculum officers to attend. The teachers program included an education workshop at which Dr Angela Belcher was the guest speaker, explaining what had inspired her to pursue a career in science. The workshop also covered innovative teaching methods related to the annual symposium topic of nanoscience.

The Australian Research Council and the Academy each sponsored three awards enabling researchers aged 35 and under to attend *Science at the Shine Dome.* Research organisations also sponsored one or two of their best young researchers to attend. The early-career researchers' program included a workshop on career development which discussed media and communication skills and writing grant proposals, and a presentation by Dr Angela Belcher about developing a career in today's research environment.

Science education assessment resources

The Academy has been actively involved in a number of national school science programs. Fellows of the Academy are involved in reviewing the scientific accuracy of this material.

The Collaborative Australian Secondary Science Project, managed by Curriculum Corporation, was established to develop a professional learning program and a set of classroom resources to change the way teachers teach junior secondary science. The project was trialled successfully in 28 schools across Australia. The final report recommending that the project progress to full-scale development and implementation is with the Department of Education, Science and Training.

The Science Education Assessment Resources Project is developing an online assessment resource bank which aims to improve the quality of science assessment for students up to Year 10.

The Primary Science Assessment Project has developed a set of performance assessment items in science for Year 6 students. In October, these items were used in the first scientific literacy benchmark test to be conducted on a sample of primary school students across Australia.

Education policy

The final report from the Government's review of teaching and teacher education, 'Australia's Teachers: Australia's Future–Advancing Innovation, Science, Technology and Mathematics', was launched in October. Coinciding with the launch of the report, a Working Group on science engagement and education was established for the Prime Minister's Science, Engineering and Innovation Council. Academy President, Dr Jim Peacock, chaired the Working Group and the Education and Public Awareness Manager, Marian Heard, represented the Academy on the Group.

The Working Group considered and made recommendations on the role of external providers in science education, links between the business community and the education sector, particular issues associated with science education in both primary and secondary schools and the importance of teachers. The Academy's strong interest in science education in primary school was reflected in the recommendation that a project linking the teaching of science with the teaching of literacy be developed. The Academy, through the Australian Foundation for Science, has funded the proof of concept for such a project.

The Working Group presented its findings to the November meeting of the Prime Minister's Science Engineering and Innovation Council.

The Group's full report, 'Science Engagement and Education: Equipping young Australians to lead us to the future', is available at www.dest.gov.au/science/pmseic/documents/Science Engagement and Education.pdf.

Population and Environment Research Fund

From September 2003 to January 2004, the Academy conducted an online conference on 'Population and Environment in Australia'. The conference, funded largely by the National Academies Forum, was based on an Academy-commissioned review of population and environment research and opinion in Australia by Dr Colin Butler. Scholars from a range of relevant disciplines were invited to respond to Dr Butler's paper and their responses were posted on the conference website. Over 130 delegates registered to take part in the members' discussion forum, with many more viewing and reading the online documents.

The issues raised in the online conference will form the basis for the next Fenner Conference on the Environment, 'Understanding the Population–Environment Debate: Bridging Disciplinary Divides', to be held at the Shine Dome on 23-24 May 2004. More information about the Fenner Conference is at www.science.org.au/conferences/fenner/index.htm.

Public events

Annual Symposium 2003

The Academy's 2003 Annual Symposium–'Nanoscience–where physics, chemistry and biology collide'–was held on 2 May as part of the *Science at the Shine Dome* events. Convened by Dr Michael Barber, the symposium showcased why science at the nanoscale is so important and highlighted the potential of such research.

Science lectures for senior citizens

Eight science lectures for senior citizens, funded by a grant from the ACT Office of Training and Adult Education, were run in conjunction with Woden Senior Citizens Club in Canberra. The lectures were very well received.

National Science Week

The Academy ran its inaugural National Science Week Speakers Program in August. It involved a presentation from an Academy speaker in each State and Territory, and was run in association with the local National Science Week Committees. At the Shine Dome in Canberra, Professor Robyn Williams hosted a panel discussion on 'Serendipity in science' as part of the Australian Science Festival. The Academy's Executive Secretary, Professor Sue Serjeantson, featured as one of the panellists.

National Youth Science Forum

The National Youth Science Forum again held the opening lectures of its two sessions in the Shine Dome. This year, to celebrate the Academy's 50th Anniversary, Professor Rod Rickards gave an overview of the Academy's role and several Fellows joined the students for morning tea. The Academy also provided expertise on the mock interview panels for the students.

Telstra National Press Club Address

Dr Jim Peacock gave the Telstra Address at the National Press Club in Canberra in July. He used the address on gene technology and food to deliver a message to the nation's decision-makers who are applying moratoria and freezes to the technology. Dr Peacock emphasised that genetically modified crops present big opportunities for biotechnology in Australia. He gave the example of transgenic cotton which has been a part of Australian agribusiness for the past six years and has been a major success, reducing insecticide use and transforming the industry into one that is sustainable and high-earning for Australia.

Dr Peacock challenged his audience to consider the issues involved, believing that the application of current moratoria is not being based on evidence. He cited the concern over market access, both for transgenic and non-transgenic canola crops, as a case in point. He explained that Canada grows 85 per cent of its crop as transgenic canola and has absolutely no difficulty in marketing the crop, with no financial penalty.

He also refuted the claims that are often made which argue that genetically modified foods are potentially harmful to our health and to the environment, saying that they simply have no factual basis. He claimed that they are not only mischievous and misleading, but can also be cruel in their effects, as in a case of the refusal of food aid in Zambia, which resulted in many people starving.

The complete address is available on the Academy 's website at www.science.org.au/reports/16july03.htm.

Golden Jubilee events

Government House Reception

A formal reception was held at Government House in Yarralumla on 19 February to mark the 50th Anniversary of the founding of the Academy. On 16 February 1954, Queen Elizabeth II presented the Royal Charter to the Academy's Founding President, Sir Mark Oliphant.

The Governor-General Major-General Michael Jeffery and Mrs Marlena Jeffery extended their congratulations to the Academy and presented the current President, Dr Jim Peacock, with the Supplemental Royal Charter.

Three of the Academy's Past Presidents were amongst the Fellows and their guests who enjoyed the hospitality of the Governor-General and Mrs Jeffery.

The formal reception was preceded by afternoon tea at Ian Potter House, where the Charter Book was on display, together with the celebratory flags that will fly along Commonwealth Avenue in Canberra during May 2004.

From left: Professor Brian Anderson, Dr Jim Peacock, Major-General Michael Jeffery, Professor Frank Fenner, Professor David Curtis and Dr Lloyd Evans.

50th Anniversary Exhibition

The Academy's 50th Anniversary exhibition–*Eureka moments! Highlights from 50 years of Australian science*–will be launched at the National Museum of Australia on 5 May 2004. The exhibition celebrates Australian science by highlighting scientific innovations and endeavours that have impacted on society and culture.

After its launch at the National Museum, the exhibition will be on show in the Parliamentary Library before leaving Canberra to travel to capital cities and regional centres around Australia.

During National Science Week the exhibition will be displayed in the foyer of the Australian Museum in Sydney and the Academy will host a public lecture during this time as part of the Science in the City program.

Recent benefactors

Donations of $1,000 and above are acknowledged

Special purpose funds

Adam Berry Memorial Fund	
Family and friends of the late Adam Berry	$11,175
Dorothy Hill Award	
R Stanton	$3,000
Douglas and Lola Douglas Scholarship Fund	
L Douglas	$400,000
Fund for the Conservation of Endangered Native Animals	
Anonymous donor	$40,000
Jaeger Medal Fund	
Book royalties	$1,576
J G Russell Fund	
J G Russell	$16,000
Maxwell Ralph Jacobs Fund	
The Institute of Foresters of Australia Inc.	$1,500
Selby Fellowship Fund	
Benn Selby–Marley Pty Ltd	$17,570

Science education and public awareness funds (subset of Special purpose funds)

2004 Fenner Conference on the Environment	
Australian National University	$10,000
Department of Agriculture, Fisheries and Forestry	$10,000
Department of the Environment and Heritage	$5,000
Department of Immigration and Multicultural and Indigenous Affairs	$4,000
CSIRO Sustainable Ecosystems	$2,500
Bureau of Rural Sciences	$2,000
Monash University	$2,000
50th Anniversary Fund	
Anonymous donor	$10,100
BHP Billiton	$10,000
AGM symposia–Funds for teachers and young researchers	
D P Craig	$10,000
Australian Research Council	$6,000
National Health and Medical Research Council	$6,000
Ethnomathematics	
Pacific Resources for Education and Learning	$19,456
Population and Environment Fund	
Anonymous donor	$10,000
Primary Investigations Fund	
B R Hardy	$1,500

Nova: Science in the News

Commonwealth Bank Foundation	$50,000
Telstra Corporation	$20,000
Australian Greenhouse Office	$13,670
National Centre for Advanced Cell Engineering Facility	$6,000
NRMA–ACT Road Safety Trust	$5,500
Australian Proteome Analysis Facility	$3,000
Australian Phenomics Facility	$3,000

Video Biographies Fund

F J Fenner	$20,000
CSIRO Plant Industry	$5,000
Centre for Resource and Environmental Studies, Australian National University	$2,500

Special project grants 2004

Australian Greenhouse Office

International Climate Change Science	$50,000

Australian Research Council

Maximising the Benefits from International Scientific Linkages	$100,000

Land and Water Resources Research and Development Corporation

Review of Salinity Mapping in the Australian Context	$30,000

The Shine Dome and Ian Potter House

The Shine Dome continues to attract a wide range of hirers impressed by the unique and historic venue and the excellent audio visual facilities of the Ian Wark Theatre.

The Academy's conference program included the highly successful *Science at the Shine Dome*, the *Australian Frontiers of Science* conference, and a public forum on methods of mapping the extent of dryland salinity.

Scientific, academic and business conferences and social functions filled a busy calendar at the Dome. These included a film festival held in conjunction with the Spanish Embassy and a youth program conducted by the ACT Department of Education and Family Services. The Dome was once again the venue for the annual conference of the Transplantation Society of Australia and New Zealand and the Annual Blackburn Lecture of the ACT Law Society.

Analysis of evidence gained in the recently completed Conservation Management Plan is being used to assess areas of concern and ongoing works in and around Ian Potter House.

Events held at the Dome

Date	Function	Organisation
30 April–2 May 2003	Science at the Shine Dome	Australian Academy of Science
12 May	Science, Engineering and Technology Network (SETnet)	Australian Academy of Science and Federation of Scientific and Technical Societies
13 May	The Blackburn Lecture	Law Society of the Australian Capital Territory
21 May	National Committee for Astronomy Conference	Research School of Astronomy and Astrophysics, Australian National University
22–23 May	Spanish Film Festival	Embassy of Spain
29 May	Dining Club	The four learned Academies
30 May	Office of Chemical Safety Conference	Therapeutic Goods Administration
5 June	Through–chain Risk Profile for Australian Red Meat Industry Conference	Meat and Livestock Australia
26 June	Council meeting	Australian Academy of Science
24–25 July	Centre for Tax System Integrity Conference	Research School of Social Sciences, Australian National University
31 July–1 August	Australian Frontiers of Science Conference	Australian Academy of Science
7 August	Dining Club	The four learned Academies
14 August	Serendipity in Science with Robyn Williams	Australian Science Festival
18 August	Memorial service for Professor Richard Mark	Professor Mark's family
25–27 August	Staff training sessions	Child Support Agency
28 August	Haddon King Dinner	Australian Academy of Science
1 September	Luncheon and reception for Lord May of Oxford	Australian Academy of Science
18 September	Annual General Meeting	Australian Foundation for Science
19–20 September	Youth Forum	ACT Department of Education Youth and Family Services
24 September	Office of Chemical Safety Conference	Therapeutic Goods Administration
25 September	Council meeting	Australian Academy of Science
29 September	Climate Change and Health Conference	National Centre for Epidemiology and Population Health, Australian National University
30 September	Public lecture	National Institute for Environment, Australian National University
2 October	Dining Club	Australian Academy of Science
7 October	Launch and presentations	Cooperative Research Centre for Greenhouse Gas Technologies
15 October	Mining in Australia Conference	Golden Cross Resources

Date	Function	Organisation
16 October	Public lecture	Joint Academy Committee of Sustainability
17 October	Public forum on methods of mapping dryland salinity	Australian Academy of Science
21 October	Public meeting–Consultative Group for Resolving Deadlocks discussion paper	Department of Prime Minister and Cabinet
23 October	Library Committee	Australian Academy of Science
28 October	Fiscal Policy and Financial Markets Conference	Centre for Economic Policy Research, Research School of Social Sciences, Economics Programme, ANU
30 October	Tour of the Shine Dome for students from Canberra Institute of Technology	Australian Academy of Science
31 October	Women in Design–Luncheon	Royal Australian Institute of Architects
3 November	Materials and Complexity–Conference opening	Department of Applied Mathematics, Research School of Physics, Australian National University
8 November	90th birthday party for Professor Chris Christiansen	Professor R Frater
12–13 November	Forum of European/Australian Science Technology Cooperation–4	Forum for European/Australian Science and Technology Cooperation and National Europe Centre, Australian National University
13 November	Public lecture by Professor Yongkiang Lu, President of the Chinese Academy of Science Dinner in honour of Professor Lu, attended by the Governor–General Major–General Jeffery and Mrs Jeffery	Australian Academy of Science
14 November	In Search of Sustainability Conference	Management Committee of ISOS Rolling Internet Conference
17–18 November	Management Strategy Sessions	TLE Electrical & Data Suppliers
19–20 November	Environmental Policy Integration and Sustainable Development Conference	National Europe Centre, Australian National University
28 November	Conference dinner	Division of Immunology and Genetics, John Curtin School of Medical Research, Australian National University
3 December	ACT Government Launch	Business ACT, ACT Government
4 December	Primary Science and Literacy Group	Australian Academy of Science
5 December	Dining Club	The four Learned Academies
8 December	Council meeting	Australian Academy of Science
9–10 December	Congress on Evolutionary Computation	Australian Defence Force Academy

Date	Function	Organisation
12 December	*Nova: Science in the News* launch: Bogged down in the four-wheel drive debate	Australian Academy of Science
15 December	Intergovernmental Panel for Climate Change Conference	Cooperative Research Centre for Greenhouse Gas Technologies
17 December	Staff information meeting	ScreenSound Australia
5 January 2004	National Youth Science Forum–opening address	National Youth Science Forum
12 January	National Maths Summer School lecture	Australian National University and Australian Association of Mathematics Teachers Inc
19 January	National Youth Science Forum–opening address	National Youth Science Forum
5 February	Council and Sectional Committee meetings	Australian Academy of Science
16–19 February	Frederick and Elizabeth White Conference – Planetary Timescales : Stardust to Continents	Planetary Science Institute, Australian National University
26 February	Dining Club	The four Learned Academies
28 February	Birthday party for Professor R L Dewar	Dewar family
1 March	Humboldt Conference	Australian Academy of Science
10 March	Council meeting	Australian Academy of Science
31 March–2 April	Annual Conference	Transplantation Society of Australia and New Zealand
28 April	Meeting of Chairs of National Committees	Australian Academy of Science

Adolph Basser Library

In the past year, thanks to the generosity of Professor Frank Fenner, the Library has been able to employ a part-time assistant. This has enabled the listing of unprocessed manuscript collections and a major rearrangement of material in the basement of the Shine Dome to take place.

The Library Committee met in October and requested that the library catalogue be linked to the National Library. A pilot study on the best way to achieve this has been completed.

Visiting researchers have included members of the public, doctoral and postdoctoral students and retired people undertaking research for their own interest. The Academy's early work on national parks has been relevant to several people recently. In all, about 17 different collections were consulted.

Manuscript material has been added to two personal collections and two organisational collections and no new collections have been received. This is less than the average of 11 consignments per year and has enabled work to continue on adding listings of earlier material to the Academy's website at www.science.org.au/academy/basser/mslist.htm.

Obituary notices

Geoffrey Malcolm Badger

Died 23 September 2002, elected to Fellowship 1960

As a teacher, scientist, administrator, scholar, author, historian and patron of the arts, Sir Geoffrey Badger made outstanding contributions to Australian science, education and culture.

Geoffrey was born in Port Augusta, South Australia, on 10 October 1916 but spent his early formative years in Geelong where he attended Geelong Primary School and Geelong College. Having developed an interest in science he then enrolled at the Gordon Institute of Technology and completed the Diploma of Industrial Chemistry, a qualification for matriculation at the University of Melbourne. The award of a scholarship enabled Geoffrey to take up residence at Trinity College and enroll in the science course. After completing the ordinary degree he conducted a highly successful research project, supervised by Professor Bill Davies, and was awarded first class honours.

Stimulated by new insights into the role of organic molecules in biological systems he decided to undertake postgraduate research. As PhD programs were not available in Australia he applied, with success, for a position with Professor J W Cook's research team at the Chester Beatty Institute. He arrived in London towards the end of 1938 and almost immediately began research on growth inhibitory factors. He made rapid progress and within two years completed his PhD thesis.

Immediately after graduating in 1941 Geoffrey married Edith Chevis. He then obtained a position with ICI in Manchester where he developed a method for the large-scale production of sulphamerazine, an antibacterial sulfa drug that also had antimalarial activity and hence was required in large amounts for troops in south-east Asia.

Despite this success Geoffrey wished to undertake a more active role in the war effort. In 1943 he joined the Royal Navy, and was posted as an Instructor Lieutenant to HMS Dauntless where he taught coastal and astronomical navigation to new recruits, an activity that probably stimulated his later interests in history and exploration.

After the war Geoffrey was anxious to return to research. He was granted accelerated release from the forces and in 1946 took up one of the newly created ICI Research Fellowships at the University of Glasgow. His study of the synthesis and properties of heterocyclic compounds was very fruitful and led to the award of a DSc.

In 1949 Geoffrey accepted an offer of a senior lectureship from the University of Adelaide. As Professor H K Macbeth, the Head of the Chemistry Department, was approaching retirement he asked Geoffrey to take over the 3rd year classes in organic chemistry and gave him a free hand to set up his own research team. He immediately commenced an ambitious program on the synthesis, properties and reactions of cancer-producing compounds. In the period 1949-1954 he published 57 papers and his highly regarded monograph, *Structures and Reactions of Aromatic Compounds*.

Following the retirement of Macbeth in 1954 the university decided to divide the Chemistry Department. Geoffrey was appointed as Professor and Head of the Department of Organic Chemistry, and Dennis Jordan was chosen to fill the corresponding position in the Department of Physical and Inorganic Chemistry. Badger and Jordan comprised a formidable team that presided over a remarkable period of growth of chemistry in the university. A new building was constructed, major equipment was purchased, talented and enterprising new young staff members were appointed, and new courses and teaching methods (including the production and presentation of movie films) were introduced. Geoffrey's own research was highly successful. Using new analytical techniques he determined the mechanism of formation of cancer-producing compounds during combustion; he developed a new process for the

Extended memoirs of deceased Fellows are published in *Historical Records of Australian Science* and are available at www.science.org.au/academy/memoirs.

industrial preparation of bipyridyl; and he completed his seminal work on the preparation and properties of new macrocyclic aromatic systems.

Under Geoffrey's leadership the Department of Organic Chemistry became very highly regarded, not only in Australia but also internationally. Despite the magnitude and intensity of Geoffrey's work within the university he managed to maintain an active social life both within and without the department. Geoffrey and Edith encouraged informal activities involving staff and students, attended many departmental social events, and frequently organised parties at their home. Nor were his scientific activities limited to those associated with the university. He was an active member of various scientific and professional bodies including ANZAAS and the Royal Australian Chemical Institute (RACI) of which he became the SA Branch President and Federal President.

At the end of 1964 Geoffrey resigned from the university to join the Executive of CSIRO in Canberra, but in 1966 he returned to Adelaide University, first as Deputy Vice-Chancellor and then (1967) as Vice-Chancellor. He held this position for ten years, a period marked throughout the academic world by great student unrest focused mainly on the Vietnam War but also reflecting dissent from existing academic and community values. By and large Adelaide University weathered the storm better than most, due to Geoffrey's outstanding leadership. Not only was he able to meet reasonable requests for change from students and staff without sacrificing traditional academic standards but he also supported many innovative new initiatives including the creation of the Centre for Studies in Aboriginal Music, which he persuaded the university to support after visiting Aboriginal communities in the north of South Australia.

Despite the heavy load of the vice-chancellorship, Geoffrey continued to champion the cause of science and technology at the national level. During his time with the Academy as a member of Council (1964-67), Secretary, Physical Sciences (1968-72) and President (1974-78) he persuaded influential senior people in industry and finance to become involved with the National Science and Industry Forum and he canvassed parliamentarians about the importance of providing support for science and technology. Also he found time to publish three more monographs on aspects of organic chemistry

In 1977 he was appointed as the first permanent Chair of the newly formed Australian Science and Technology Council (ASTEC), and with characteristic vigour oversaw the preparation of a number of reports to the prime minister on such matters as the direct funding of basic research, the next generation of Australian telescopes, and marine sciences and technology. He later served as Chairman of the Technological Change Committee, as President of ANZAAS, and was appointed as a non-executive director of WMC Holdings Ltd.

Throughout his career Geoffrey's achievements attracted recognition, the most notable being his naming as an Officer in the Order of Australia and as Knight Bachelor. He was a Fellow of the Royal Society of Chemistry, the Royal Australian Chemical Institute, the Australian Academy of Technological Sciences, the Australian College of Education, and the Australian Institute of Management. He was also awarded the Leighton Memorial Medal, the ANZAAS medal, and the Chapman Memorial Medal of the Institution of Engineers. In 1980 he received the honorary degree of Doctor of the University from the University of Adelaide.

In 1982 Geoffrey retired from ASTEC in order to spend more time on other activities, including his interests in history and exploration. In 1971 he had been an editor and co-author of the book *Captain Cook, Navigator and Scientist*. Now he returned to this field with the publication of *The Explorers of the Pacific*, in which he achieved popular readability without sacrificing navigational or historical accuracy. Despite increasing ill-health he continued to write during the 1990s. His last book, *The Explorers of Australia*, was published in 2001.

Geoffrey also pursued a number of other activities. He was a member of the Friends of the Art Gallery of South Australia and a patron of the National Gallery of Australia, and he became involved with the work of the Koala Foundation. Despite his manifold achievements and his appointment to many high offices Geoffrey remained an essentially private, modest and unassuming man who won and retained the affection and admiration of his many ex-students, colleagues, and friends.

A L J Beckwith

Robert Hanbury Brown

Died 16 January 2002, elected to Fellowship 1967

Hanbury, as he was known to friends and colleagues around the world, was born in India on 31 August 1916. He was educated in England from the age of three and entered Tonbridge School as a Judde scholar in classics in 1930. His interests turned to science and technology and after two years at Tonbridge he undertook a University of London external engineering degree course at Brighton Technical College. At the age of 19 he graduated with first class honours in advanced electrical engineering and, in 1935, he went to Imperial College and the following year obtained the Diploma of Imperial College.

Hanbury intended to continue his studies for a PhD but accepted a job that took him to Bawdsey Manor in Suffolk and his career as one of the pioneers of radar and as the prototype 'boffin' began. In the pre-war years and during the Second World War Hanbury worked on the development and applications of radar. He was particularly involved with airborne interception radar until early in 1941 when, during a training flight with the Fighter Interception Unit, his oxygen supply failed at high altitude and he was unconscious when the aircraft landed. As a result he was to suffer from impaired hearing for the rest of his life. No longer able to fly at high altitude he worked on transponder systems that were used to guide the dropping of agents, equipment to resistance groups, and airborne forces in enemy territory.

From 1942–45 Hanbury was stationed in Washington, collaborating on radar and transponder systems. On his return to England he took charge of a group developing aircraft navigation aids at the Telecommunications Research Establishment, but in 1947 he was persuaded by R A Watson-Watt to leave the scientific civil service and become a junior partner in his new firm of research consultants. Hanbury's main occupation was with radio and radar aids to navigation in Europe and the USA but, in 1949, Watson-Watt moved his firm to Canada and Hanbury resigned.

Hanbury decided to resume his academic career and chance took him to the Jodrell Bank Experimental Station of the University of Manchester where, with an ICI Research Fellowship, he registered for the degree of PhD with the aim of improving his academic qualifications. This was the start of a brilliant phase of his career. When he joined Jodrell, very few astronomers believed that radio waves from outside the Milky Way galaxy formed a significant part of the cosmic radio waves received on Earth. Using his technical expertise to build sensitive receivers and to devise new techniques, he obtained the first decisive proof that radio emission was not unique to our own galaxy. Within a few years Hanbury had become a most distinguished international figure in astronomy and, in 1960, the University of Manchester elected him to a personal chair of radio astronomy, awarded him the honorary degree of DSc and the Royal Society elected him a Fellow.

In 1950, worrying over technical problems with conventional radio interferometry, Hanbury had the idea that a correlation would exist in the fluctuations in intensity of a source observed at two antennae and that it would decrease as the separation of the antennae increased. This was the birth of intensity interferometry that was subsequently to change the direction of Hanbury's career again. He enlisted the assistance of R Q Twiss in developing a detailed mathematical treatment but it turned out that the important application of the technique was in optical rather than radio astronomy. This was not apparent at first and generated considerable controversy, including claims that the principle violated the fundamental concepts of quantum mechanics. As one demonstration of the validity of the technique, Hanbury determined the angular diameter of Sirius by measuring the correlation as a function of the separation of two searchlights that he used as his light collectors. Carried out almost unaided in winter months, this was an incredible achievement, as Sirius never rises above 20° elevation at Jodrell.

The success of the Sirius experiment led Hanbury and Twiss to design the Narrabri Stellar Intensity Interferometer (NSII). Initially, Hanbury took leave from Manchester in 1962 to work on the NSII but in 1964 he was appointed to a Chair of Physics (Astronomy) and Head of the Chatterton Astronomy Department at the University of Sydney to direct the NSII program. The story of the NSII was described by Hanbury in his books *The Intensity Interferometer* and *Boffin*.

The instrument made major contributions to stellar astrophysics, including the first measurements of the angular diameters of 32 hot stars to provide the foundation for the temperature scale for stars hotter than the sun. These results had not been superseded in 1997 on the occasion of Hanbury's 80th birthday, some 25 years after the NSII observational program was completed. A new, more sensitive interferometer was proposed at the completion of the NSII program and, although initially it was to have been an intensity interferometer, it was finally decided that a modern form of Michelson's classical stellar interferometer, using new technology, promised greater sensitivity. At this point Hanbury was nearing retirement and chose to hand responsibility for developing the Sydney University Stellar Interferometer (SUSI) to John Davis, who had worked with him throughout the NSII program.

Hanbury retired in 1982 and spent the last years of his life in England but enthusiastically supported and retained his interest in the SUSI project until his death.

Hanbury was internationally respected and admired–nowhere is this more evident than within the space of a few years he addressed the World Council of Churches in 1979 on 'Faith, Science and the Future' and also presided over the International Astronomical Union General Assembly in Delhi during his term of office as President of the Union from 1982–85. He became increasingly interested in the relation of science to society and his book, *The Wisdom of Science*, is concerned with the relevance of science to culture and religion. He received many honours, prizes and honorary degrees in recognition of his outstanding contributions to radio and optical astronomy. These included the Holweck Prize of the Physical Society, the Lyle and the Matthew Flinders Medals of the Australian Academy of Science, the Britannica Australia Award, the Hughes Medal of the Royal Society, the Eddington Medal of the Royal Astronomical Society and the Albert A Michelson Medal of the Franklin Institute, the last two jointly with R Q Twiss. He was elected a Fellow of the Australian Academy of Science in 1967 and held the office of Vice-President from 1977–79. He was appointed a Companion of the General Division of the Order of Australia in 1986. He was also awarded honorary doctorates of science by the University of Sydney and by Monash University.

Hanbury married Heather Chesterman in 1952 and they celebrated their Golden Wedding shortly before he died. Their children, Marion and twin sons Robert and Jordan, were born in England but educated in Australia. His last book, *There are no Dinosaurs in the Bible*, written for his grandchildren and published posthumously, reflects his ultimate conclusion that there are fundamental issues in science that lie beyond human understanding.

John Davis

Clifford Walter Emmens

Died 18 June 1999, elected to Fellowship 1956

Clifford Walter Emmens was born on 19 December 1913 in Peckham, London, the youngest of a family of three children. His father was Walter James Emmens, an insurance loss assessor, and his mother was Narissa Louise (née Pugh). The family moved to Purley, Surrey, when Emmens was 10 and he describes there the early interest in pond life that was to foreshadow his later academic pursuits in biology and his recreational activities as an aquarist. His early schooling was at the Purley County School for Boys, obviously a good one, as in his final year it obtained the three top scholarships to the University of London's Agricultural College at Wye in Kent. Emmens was awarded one of these. Evidently not liking agriculture at that stage, he transferred in his second year to University College, London with an honours major in zoology and a subsidiary in physiology. He was eventually awarded BSc, MSc, PhD, and DVSc from that institution in 1935, 1936, 1939 and 1947 respectively.

After graduation he joined the National Institute for Medical Research (NIMR) at Hampstead, London, (described by Emmens as 'the ‘ouse of ‘orror on the ‘ill') and soon earned an enviable reputation for his prodigious research effort and output. He married Muriel Edith Bristow, a ballet dancer, and daughter of Henry Roderick Bristow and May Bristow (née Savell), in 1937. The marriage yielded four children, Jane (b. 1941), Roger Leonard (b.d. 1942), Harriet (b. 1943) and Roger Lyle (b. 1951, d. 1993). During the Second World War, Emmens was seconded to the Ministry of Home Security initially to work with Professor Zuckerman at Oxford on the effects of bombing on morale and later to the RAF as Hon. Wing Commander to join various bombing assessment units, where his biometrical skills proved to be invaluable.

After the war he returned to the NIMR, to be enticed to the University of Sydney in 1948 to set up the Department of Veterinary Physiology, and he filled its Chair in 1950. In a very few years, his extraordinary administrative and scientific skills resulted in the establishment of a formidable department with a staff of more than 50, largely funded from external sources. A unique aspect of the department was that the research interests of all its members involved reproduction. Throughout his career he encouraged both staff and students to pursue emerging areas of reproductive biology, such as developmental biology.

In 1952, having just established a productive department at the university, he was invited to set up the Sheep Biology Laboratory at Prospect, later to become the CSIRO Division of Animal Production. For some time, he ran both the university department and the Prospect laboratory simultaneously, until a director was appointed at Prospect.

His early research interests in Sydney concentrated on the freezing of semen, particularly of the ram and bull, and on artificial insemination, which was most successful. However, he soon turned his attention back to his early interest in endocrinology to study various aspects of oestrogens and antioestrogens, with the aim of discovering a compound with antifertility activity but without significant side effects. This work was substantially supported by the Ford and Rockefeller Foundations, as well as by several pharmaceutical companies. The problems experienced with thalidomide and other compounds about this time meant support for such work declined, and he turned in his later years to more basic investigations on the nature of the oestrous cycle, with a comparative emphasis.

Emmens contributed very significantly to Australian and international science. He was elected a Fellow of the Australian Academy of Science in 1956 and served on its Council from 1965–68. His roles as President of the Endocrine Society of Australia (twice), Chairman of the Australian Society for Reproductive Biology, Section President of ANZAAS, President of the 2nd Asia and Oceania Congress of Endocrinology, Chairman of the Biological Sciences Sub-committee of the Australian Research Grants Commission and Chairman of the Board of Standards of the CSIRO Australian Science Journals are just some examples of his contributions. He was awarded an honorary DVSc from the University of Sydney, an honorary FACVSc , the Oliver Bird Medal and Prize (UK) and the Instituto Spallanzani Medal.

Cliff Emmens retired in 1978 and spent many of the next 20 years on his life-long interest as an aquarist. During this time he wrote ten books on the subject and also had many articles published in aquarists' magazines. He was Patron of the British Marine Aquarists Association and the Marine Aquarium Research Institute of Australia.

Emmens died in Sydney on 18 June 1999 and is survived by two daughters. An obituary in *Tropical Fish Hobbyist* reads, in part, 'scientist, teacher, author, aquarist, judo black belt, ballroom dancer...', an apt summary of this complex and remarkable man. What could have been added is that he was a much respected and admired colleague.

Grant Stone
Ray Wales

Kenneth Hedley Lewis Key

Died 11 January 2003, elected to Fellowship 1959

Ken Key, born in Cape Town on 28 August 1911, spent his early boyhood in Pretoria where by the age of seven he had already become interested in insects. On returning to Cape Town in 1921 he attended the Rondebosch Boys High School, from which he matriculated in 1927. He enrolled at the University of Cape Town in 1928 for a BSc course with majors in zoology and botany; entomology as such not being an available subject.

Graduating in 1930 with distinction and class medals in zoology and botany, he chose a study of local grasshopper species as a research topic and completed his MSc degree in 1931, winning the University's Purcell Memorial Prize and gaining the George Grey Memorial Scholarship. The latter enabled him to proceed in 1932 to London University's Imperial College of Science and Technology to enroll as a PhD student in the Department of Entomology.

Ken's research involving the behaviour of *Locusta migratoria*, which included participation in taxonomic work at the British Museum of Natural History, led to the award of his PhD degree in 1936. In 1935 R J Tillyard, Chief of the CSIR Division of Economic Entomology, had advertised for an assistant research officer to investigate the 'grasshopper' (locust) problem in Australia. Ken was encouraged to apply, was appointed and arrived in Australia in May 1936.

By September he was carrying out his first investigations in northern New South Wales and south-western Queensland, and initially faced two problems: his lack of knowledge about rural conditions in Australia and his lack of experience of working under direction, particularly direction which he regarded as 'inadequately informed'. He soon overcame these problems, eventually achieved a more independent research status and provided valuable information about the life-cycle, and regional and seasonal incidence of the Australian locust (*Chortoicetes treminifera*). Knowledge of where and how locust plagues originate was expected to lead to a more rational and radical strategy for locust control.

He kept meticulous and detailed notes regarding the exact location of his collecting sites, the type of country, and the vegetation. He was equally meticulous in his studies of specimens in the laboratory, and his notebooks remain an invaluable part of the Australian National Insect Collection records. Ken recognised the need for more information about Australia's insect fauna; in 1955 some 50 per cent of the specimens he collected on a field trip had not been previously described. In the late 1950s he became involved in the overall taxonomy of grasshoppers and stick insects and with the institutional control of the Division's impressive insect collections. He was appointed Curator of the Collections in 1959, and was Chief Curator from 1968 until 1971. From 1959 he published some 40 papers on the taxonomy of Australian insects, alone and with co-authors, and several others on theoretical and methodological issues in taxonomy. Amongst his 96 publications are contributions to both editions of *Insects in Australia*.

Ken Key was elected to the Fellowship of the Academy in 1959, was a member of Council from 1975-78, and served on a number of committees. He was foundation President of the Ecological Society of Australia, a foundation member of the Australian Entomological Society, and a member of both the Linnean Society of New South Wales and the Royal Entomological Society of London. In the 1950s and 1960s he was an active member of the International Commission on Zoological Nomenclature, playing a leading role prior to the 1961 revision of the International Code of Nomenclature. In 1973 he was appointed to the Interim Council of the Australian Biological Resources Study.

In August 1976 Ken retired from his position as Chief Research Scientist in the CSIRO Division of Entomology but continued his taxonomic studies on grasshoppers as an Honorary Fellow. He published taxonomic revisions and papers until December 1994 when illness forced his second retirement from CSIRO. He was married three times and is survived by a son and four daughters.

Murray S Upton

Ian Munro McLennan

Died 25 October 1998, elected to Fellowship 1980

Very few men have been privileged to have lived not only through a period of great industrial growth in their country but to have been a major contributor to that growth. Sir Ian McLennan, who died in Melbourne on 25 October 1998, was such a man.

Ian Munro McLennan, son of R B McLennan, was born in Stawell, Victoria on 30 November 1909 to a family who had a business in Mooroopna. He was educated at Shepparton High School followed by Scotch College, Melbourne where he was equal dux in 1927, and his combination of academic excellence and leadership there could be said to have foreshadowed his later life. He completed his education at Melbourne University, graduating in electrical engineering in 1932, joined the Broken Hill Proprietory Co. Ltd (BHP), as a cadet at the Whyalla works in 1933 and finally became a special cadet at the Newcastle Steelworks in 1937, the year he married Doris, daughter of M H Robertson.

It was a time of expansion in the steelworks and he was appointed successively Executive Officer, Production Superintendent, and finally Assistant Manager in September 1943. Thus he was fully involved during the Second World War with the need for high production rates; with the development of new products such as ferroalloys, magnesium and tungsten carbide, required to replace imports; and with problems of labour shortages and unrest.

In 1947 he was appointed Assistant General Manager at BHP's head office in Melbourne, where he became much more involved with developments at Australian Iron and Steel (AIS), finally being appointed Acting General Manager of AIS in 1949. In the same year Prime Minister Chifley invited him to join the Immigration Planning Council; he was Deputy Chairman of the Council to 1967.

Ian McLennan was appointed General Manager of BHP in February 1950, becoming fully involved with the continuing expansion of both BHP and AIS. He became a Director and Assistant Managing Director of AIS in 1951 and in 1955 saw the modern hot strip plant commissioned at AIS, a major project he had strongly supported. In 1956 he was appointed a Commander of the Order of the British Empire in recognition of his public service; he was raised to Knight Commander of the Order of the British Empire in June 1963 for services to industry.

Sir Ian was a strong supporter of proposals involving installation of up-to-date processes and equipment, and ensured that senior staff went overseas at regular intervals to keep abreast of developments. He also strongly supported the expansion of research and development activities and, in 1957, the large BHP Central Research Laboratories were opened in Newcastle; a second laboratory opened at Clayton in 1969.

He became Senior General Manager of BHP in 1955 and was able to convince the BHP Board to take an unusual step and agree to a survey for oil in Bass Strait, following recommendations from an American expert. As is now well known, subsequent drilling discovered first gas in 1965 and later oil, both in commercial quantities. He continued to be fully involved in complex negotiations to find ESSO Australia as a joint venture partner for development of the field, while maintaining 50 per cent ownership for BHP. A momentous development in 1967 saw long-term supply contracts with the Victorian Gas and Fuel Corporation.

In 1967 Sir Ian became Managing Director of BHP, having seen steelworks operating in Whyalla, basic oxygen steelmaking replace open hearth processing at Newcastle and Port Kembla, ferroalloy production in Tasmania, manganese quarries opened on Groote Eyland and the development of the Mt Newman joint venture covering iron ore in Western Australia.

He was appointed BHP's Chairman and Director of Administration in April 1971 and, when BHP acquired an interest in John Lysaght Australia Ltd, he became Chairman of the joint company BHP-GKN Holdings Ltd. He was also Chairman of AIS; Chairman of Australian Wire Industries Pty Ltd, and Chairman of Hematite Petroleum Pty Ltd. Apart from BHP companies, Sir Ian held directorships in a number of local companies, including ICI Australia Ltd, Henry Jones (IXL) Ltd,

Interscan Australia Ltd, and ANZ Banking Group Ltd, of which he became Chairman in 1977. In addition, between 1969 and 1975, Sir Ian was Chairman, Defence (Industrial) Committee and in the first year led the Australian Federal Government Defence Industries Mission to the United States.

After chairing an interim working group, Sir Ian was elected President of a new Academy of Technological Sciences (later to include 'and Engineering') in 1975, and over the next decade was a driving force behind many of the activities of the Academy, which established programs such as annual symposia on important national topics and developed close relationships with State and Federal governments. He helped forge closer ties with China and led a delegation of Fellows there in 1983. When he retired as President in 1983 he was accorded the title 'Foundation President' and later, when the Academy purchased a permanent home, it was called 'Ian McLennan House', a fitting tribute.

Sir Ian chaired a symposium held at the Australian Academy of Science's 10th AGM in May 1964, which dealt with scientific and technological research in relation to the development of Australian industry. His comment that industrialists would welcome closer contact with leaders in science, and his later participation in a discussion meeting in October 1966, were important to the Academy establishing its Science and Industry Forum in December 1966. He was elected to the Fellowship of the Academy in 1980.

He was a Fellow of the International Academy of Management as well as being a member of some 36 committees, councils, institutes or missions, including Director of the Australia-Japan Academic and Cultural Centre, Foreign Associate of the National Academy of Engineering, Chairman of the Melbourne University Engineering School Foundation, Foreign Fellow of the Royal Swedish Academy of Engineering Sciences, and Director of the International Iron and Steel Institute (Great Britain). He was Patron of the Australia-Japan Business Cooperation Committee and, from 1978 to 1982, he was a member of General Motors Advisory Council.

Sir Ian was appointed as Knight Commander of the Order of St Michael and St George for services to youth, community and industry in 1979, and in the same year was awarded the Bessemer Gold Medal of the Metals Society (Great Britain). Other awards included honorary doctorates of engineering from the University of Melbourne and the University of Newcastle, an honorary doctorate of science from Deakin University, and an honorary doctorate of laws from the University of Melbourne. He was awarded the James N Kirby Medal, the Peter Nicol Russell Medal, the Kernot Memorial Medal, the Charles F Rand Memorial Gold Medal and received the First Class Order of the Sacred Treasure from the Emperor of Japan.

Sir Ian McLennan was a great leader with vision and the will to have the vision realised, his outstanding achievements must include the AIS hot strip mill, the discovery and harnessing of oil and gas, the iron ore developments in Western Australia and wisely guiding a newly inaugurated Academy, the Academy of Technological Sciences. Sir Ian was a gifted man who will be missed in business and in the community. He is survived by two sons, Peter and John, and a daughter, Louise.

Peter N Richards

Bernhard Hermann Neumann

Died 21 October 2002, elected to Fellowship 1964

Bernhard Neumann arrived in Australia to become Professor of Mathematics at the Australian National University (ANU) in October 1962. He lived in Canberra till his (sudden) death at the age of 93 on 21 October 2002. He is survived by his wife Dorothea and the five children of his first marriage (to Hanna, who was also a Fellow of the Academy at the time of her death in 1971).

Bernhard came to Australia with an outstanding reputation for his seminal work on infinite groups and more broadly in algebra. He also published in geometry. More importantly he was a

strong supporter of all endeavours in mathematics–he supported people who did mathematics for its own sake, people who applied mathematics and people who taught mathematics. To him it was important to share and spread the joy of doing mathematics.

Bernhard was elected to the Fellowship of the Australian Academy of Science in 1964. The citation noted his contributions to group theory, that he had established himself as one of the leaders of mathematics in the country and his determination to foster mathematics on a national scale. He served on Council (1968–71), was a Vice-President (1969–71), and gave the Matthew Flinders Lecture in 1984. He served an extended term on the National Committee for Mathematics (1963–75) and on Australian delegations to many meetings of the International Mathematical Union (IMU), held in conjunction with International Congresses of Mathematicians (he attended 13 of these congresses). At the Nice meeting in 1970 he was appointed to improve communication among mathematicians. This led to his founding the *IMU Canberra Circular*, which he edited almost single-handedly from 1972 to 1999; it provided timely information about mathematics meetings as well as announcements of honours and deaths within the mathematics community internationally. Its circulation rose to more than 1100 before becoming largely electronic. It was especially valued by colleagues outside the major centres and Bernhard ensured that it continued to circulate to them on paper. Bernhard also served (1975–9) on the Exchange Commission of the IMU.

Through the Academy he initiated the Australian Subcommission of the International Commission on Mathematical Instruction (ICMI), chaired it (1968–75) and was the Australian representative on ICMI. He was a member at large of ICMI (1975–82) and of its Executive Committee (1979–82). This was the basis for Australia's hosting of the Fifth International Congress on Mathematical Education in Adelaide in 1984. In addition, he was active in getting the Academy involved in providing materials for schools; after a long gestation period, six volumes of *Mathematics at Work* appeared in 1980–81.

He became involved in Olympiad activities as well. He chaired the Australian Mathematical Olympiad Committee from its inception in 1980 until 1986. In addition, his work for ICMI as chairman of a Site Committee (1981–83) for the International Mathematical Olympiads resulted in better structure and operation for these competitions. The holding of the 1988 IMO in Australia, in our bicentenary year, had much to thank him for.

He also contributed notably to the social activities of the Academy, as is noted in Professor Frank Fenner's book, *The First Forty Years*.

Such a long and active life cannot easily be compressed into a few words. Fortunately we have his own description in a long recorded interview as one of the Video Histories of Australian Scientists (edited transcript at www.science.org.au/scientists/bn.htm), in the essays he wrote to introduce the chapters in the *Selected Works of B H Neumann and Hanna Neumann* (1988), and in his entry in the *International Who's Who*. So we can be brief.

He was born on 15 October 1909 in Berlin and grew up there. He studied at Freiburg and Berlin and earned his doctorate in 1931, making him one of the youngest students ever to receive this award in mathematics from a German university. In August 1933, being Jewish, he left Germany for England where he became a research student again, in Cambridge, and took a PhD in 1935. Positions were scarce and it was late 1937 before he began a university career as a temporary assistant lecturer at Cardiff. He was then, with the onset of the Second World War, interned as an alien and later recruited into the British military. He recommenced his university career in 1946 as a temporary lecturer in Hull and then in 1948 moved to Manchester where later he became a Reader. In 1949 he won a prize for his solution of a problem on infinite groups proposed by the Wiskundig Genootschapte Amsterdam. He wrote a winning essay for the Adams Prize (1951–52); published as 'An essay on free products of groups with amalgamations'.

In 1938 he married Hanna von Caemmerer after a long secret engagement. They raised their five children under the sometimes difficult domestic arrangements associated with two careers. Hanna, the first woman to become a professor of mathematics in Australia (also at the ANU), was a Fellow of the Academy, and died in 1971 while on a lecture tour in Canada (see

www.science.org.au/academy/memoirs/neumann.htm). Two of their children, Peter and Walter, are also well-known university mathematicians.

He married Dorothea Zeim in 1973. They provided a steady, welcoming and supportive environment especially for visitors and young people, in mathematics, in music and quite generally.

Bernhard Neumann first visited Australia in 1959. He landed in Perth and left from Brisbane three months later, having visited and lectured at most of the universities in Australia. He had just been elected a Fellow of the Royal Society of London for his researches in abstract algebra and, in particular, for his numerous and influential contributions to the theory of infinite groups.

In 1960 Bernhard was invited to become the Foundation Professor of Mathematics in the Research School of Physical Sciences at the ANU, with the special goal of establishing a healthy PhD program in mathematics. He attracted active researchers to his new department, three of whom were elected to the Academy. During Bernhard's headship (1962–74) about 50 graduate students completed their degrees. He always had an open door and fostered a feeling of family. The students sometimes found his expectation of intellectual rigour daunting but came to appreciate it. They have gone on in diverse ways–quite a few of them made their careers in Australian universities, and Bernhard lived to see many of them make a significant mark. He travelled widely, giving many talks, attending many conferences and spreading the message that good mathematics was being done in Australia and that Australia was a good place in which to do mathematics.

He expected intellectual rigour not only in mathematics but more widely. He was also known for his rigour in other activities such as editing typescripts and recording of minutes of meetings.

The first two international conferences in Australia on mathematics were held under his leadership, on the theory of groups, in 1965 and 1973. Both were notable for the quality of the main speakers and the range of countries from which they came. The first was also notable because Bernhard was able to arrange for young people from overseas to earn their way to Australia by teaching at a university here. A third international conference on the theory of groups was held in 1989 to mark his 80th birthday.

Bernhard was active in mathematical circles in Australia. He was President of the Australian Mathematical Society (1964–66), was elected an honorary member in 1981, and was further honoured by having a prize named after him for the most outstanding talk by a student at the annual meeting of the Society. Two of his mathematical grandchildren have won that prize. Bernhard also helped found the Australian Association of Mathematics Teachers and was its first President (1966–68).

Most of his mathematical life was spent in Australia. During his time in Australia he contributed much to mathematics here and became a much loved and respected figure. He was a positive influence on an immense number of people. He was made a Companion of the Order of Australia in 1994 for service to the advancement of research and teaching in mathematics. His portrait was painted by Judy Cassab.

He was awarded honorary doctorates from a number of universities: the University of Newcastle (NSW), Monash University, the University of Western Australia, the University of Hull, the ANU, Waterloo University and the Humboldt University of Berlin.

On retiring as Professor and Head of the Department of Mathematics at the end of 1974, he was made Professor Emeritus and an Honorary Fellow of ANU. He was also appointed a Senior Research Fellow at CSIRO for three years and then became an Honorary Research Fellow, reappointed annually, till his death. In 1975 he also became an Honorary Member of the Canberra Mathematical Association, the Australian Association of Mathematics Teachers, and the New Zealand Mathematical Society.

In 'retirement' he continued his own research in mathematics and his support of work in mathematics by others, directly, through teaching, and through editorial and committee work.

For example, he served as a member of the Academic Advisory Council of the Royal Australian Naval College. He continued to be an ambassador for mathematics and for Australia. In particular he continued to support activities aimed at stimulating and developing mathematics talent. He gave considerable encouragement to Peter O'Halloran and his colleagues involved in the formative stages of what is now the Australian Mathematics Competition and maintained an active interest in it. The Australian Mathematics Trust recognises, through the B H Neumann Awards, people who have made significant contributions over many years to the enrichment of mathematics learning in Australia and its region.

Bernhard was not a person who was narrowly focused on mathematics. He was well known in other circles. On his first visit to Australia he played in many chess clubs. At the time of his death he was the oldest rated chess player in the country. He was known to the broader Canberra public as a familiar figure cycling on its roads; in more recent times wearing an electric blue helmet. He was an active musician. He played the cello and recorder. He was for many years Vice-President of the Friends of the Canberra School of Music; he helped judge an annual chamber music competition the day before he died. He enjoyed exploring the countryside and showing visitors around it.

In spite of all this visible activity he was perhaps at his best giving quiet, often unnoticed and unrecognised help to individuals.

Bernhard Neumann was the right person at the time for mathematics in Australia with his energy, enthusiasm and commitment to the subject and to people. During his lifetime, Australia changed from a mathematically underdeveloped country to one with a significant mathematical profile which he built with help from many others.

His was a life well lived.

M F Newman
Cheryl E Praeger

John Robert Philip

Died 26 June 1999, elected to Fellowship 1967

John Philip was struck by a car and killed in Amsterdam, where he was visiting the Centre for Mathematics and Information Science. He was Australia's most distinguished environmental physicist; his pioneering work on water, energy and gas movement in the natural environment is internationally acclaimed.

John was born in Ballarat, Victoria on 18 January 1927 and attended Foster Central School. He displayed prodigious mathematical talent at an early age and won an open scholarship to Scotch College in Melbourne, where his intellectual world expanded and he developed his work ethic. There, too, he developed his lifetime avocation for poetry. John matriculated at 13, and spent a further two years studying Leaving Honours before he could enter Queens College in the University of Melbourne. He took a Bachelor of Civil Engineering degree at 19. On graduation, as a university graduate assistant, he was seconded to the CSIR Irrigation Research Station in Griffith. With his acute mathematical and physical insights he quickly identified an array of scientific problems about water movement in the soil–plant–atmosphere environment, later remarking, 'I blundered into a vocation that turned out, over the past 50 years, to be more fun than work'.

From 1948 to 1951 he was responsible for design in the Burdekin and Mareeba Irrigation Schemes of the Queensland Water Supply Commission and, while in Brisbane, developed strong links with Brisbane bohemia including the artist Charles Blackman, the poet Barrie Reid, and the (later) London music critic and writer, Charles Osborne. He also married Frances Julia Long, whose artistic connections gave John further entrée to the world of art and ideas. In 1951 John rejoined CSIRO. His boss was Otto Frankel, who strongly identified with the research ethos of Rivett's CSIRO, 'find the best person for the task and give them the freedom to get on with it',

but was perplexed by John's brash enthusiasm and was ill-at-ease with his mathematical and physical approach to environmental problems. Professor Pat Moran and Professor John Jaeger at the Australian National University reassured Otto, and John Philip followed his scientific instincts. John regarded Jaeger as the closest person he had to a scientific mentor and was delighted to receive the Jaeger Medal of the Academy in 1999. John's work in Deniliquin brought unity to the very complicated field of unsaturated water and heat flow in soils. The synergy of innovative mathematics and profound physical insights in the resulting papers culminated in a Doctorate in Science awarded by the University of Melbourne. Much modern theory is based on these analyses.

John moved to Canberra to establish the Agricultural Physics Section within CSIRO's Division of Plant Industry in 1959. Broadly, its aims were to relate laboratory to 'real world' studies and to develop physically based, mathematical descriptions of environmental processes as keys for prediction and management. The Section represented each of the three components of the Soil-Plant-Atmosphere-Thermodynamic Continuum, a concept conceived to describe water and energy transfer in the biosphere. It also included a fourth group, led by John himself, named Applied Mechanics, which provided a theoretical framework for the other more experimental groups. The Agricultural Physics Section was small, and remained so even after it became the Division of Environmental Mechanics in 1970. John's rigorous pursuit of scientific quality ensured that Environmental Mechanics was recognised internationally as a centre of excellence and, except for a five-year period as Director of the CSIRO Institute of Physical Sciences, John was Chief until his retirement.

In 1975 John chaired the Science Task Force of the Royal Commission on Australian Government Administration. His report argued for government science characterised by freedom of action, accountability to taxpayers and strong links with users. It reflected a belief that research should be 'applicable', without specifying the time-frame too closely and his often stated motivation was 'to improve engineering practice' using mathematical models based on sound physics firmly focused on Occam's Razor. He encouraged this philosophy within his Division, and sought to provide an environment conducive to creative research and the Division's F C Pye Laboratory, conceived by Frances and John, is both elegant and functionally efficient, its open design cleverly planned to promote strong interaction among the occupants. John became the first CSIRO Fellow Emeritus when he 'retired' in 1992. His retirement saw no diminution in the flood of ideas and original, incisive analysis. He maintained close collaboration with scientists round the world. His more than 300 scientific papers are skilfully crafted models of brevity and precision.

John's dedication to science did not preclude other interests: he was a catholic reader, a published poet, an accomplished cook, and a connoisseur of architecture. He was a jurist for the Sulman Award for Architecture. John served on the Academy Council from 1972–78 and was Secretary (Biological Sciences) from 1974–1978 and, in addition to his Jaeger Medal, he was awarded the Lyle Medal in 1981. He was a Fellow of the Royal Society of London, a Fellow of the American Geophysical Union, a Foreign Member of the All-Union (later Russian) Academy of Agricultural Sciences, and only the second Australian Foreign Associate of the US National Academy of Engineering. He was the first non-American recipient of the Robert E Horton Medal, the highest award for hydrology of the American Geophysical Union. He was made Officer of the Order of Australia in 1998 for 'services to the science of hydrology'.

John Philip was a difficult, sometimes outrageous, man. Scientifically, he was uncompromising and unforgiving, competitive and petulant. He eschewed computers till late in his retirement and drew graphs by hand. Personally, however, he could be very kind although his mothering of a collection of acquaintances was concealed.

Frances, his children Peregrine, Julian and Candida, his brother Graeme, and four grandchildren survive him.

David Smiles
(with assistance from John's colleagues
from CSIRO and ANU)

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