



## Higher education research

There is a need for further reform of the funding mechanisms for higher education research and research training, according to the Academy. In response to an issues papers circulated by the Commonwealth Department of Education, Science and Training, the Academy emphasised the need to modify the existing research funding structure in relation to how research performance is measured and how this assessment should influence funding.

The submission states that 'unless it is possible to demonstrate that the funding mechanisms for higher education research are such that, to the greatest possible extent, the most innovative research of the greatest value

to Australia is supported, arguments for increased funding for research will be unsuccessful'.

The submission said that there was an inadequate focus on quality and outcomes in the allocation of the block research grants to institutions. The performance indicators currently used to generate the Research Quantum are research income, publications output and higher degree research student completions using the two most recent years' data.

The Academy said that measuring the volume of papers produced by a university was discredited as an indicator of quality and should be dispensed with immediately. The

submission described a research assessment exercise that could replace this measure.

The Academy also expressed surprise at how little attention research and related issues have received in the Commonwealth government's review of higher education. University research and development is 27 per cent of Australia's total research expenditure. Universities also train researchers, producing 3800 PhD graduates each year.

The full submission is available from the Academy's website at [www.science.org.au/academy/media/13September02.htm](http://www.science.org.au/academy/media/13September02.htm).

## Fenner wins PM's prize

One of the Academy's most eminent Fellows, Professor Frank Fenner, has won the 2002 Prime Minister's Prize for Science. Mr Howard presented the \$300 000 prize at a ceremony held in August in the Great Hall of Parliament House in Canberra.

Professor Fenner's research career began after World War II when Sir Macfarlane Burnet offered him a position at the Walter and Eliza Hall Institute of Medical Research in Melbourne. There he examined how the ectromelia virus spread in mice. This early research into the spread of viruses in mammals led to extensive work in determining how chickenpox and smallpox spread throughout human communities. His groundbreaking research into myxomatosis during the 1950s and 1960s resulted in the control of the rabbit population in Australia.

In the 1960s he was appointed chair of the Global Commission for the Certification of Smallpox Eradication and began his association with the World Health Organization, which



*Jim Peacock, Frank Fenner and John Howard at the award ceremony.*

continues today. His work towards the eradication of smallpox led to the award of the prestigious Japan Prize in Preventative Medicine in 1988 and the Albert Einstein Science Award in 2000. In 1995 Professor Fenner was awarded the

Royal Society's Copley Medal for his research on myxoma and pox viruses and their relationship with the host in causing disease.

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Newsletters are available on the Academy's web site, [www.science.org.au/academy/newslett/newslett.htm](http://www.science.org.au/academy/newslett/newslett.htm).

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## Fenner wins PM's prize

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From his appointment as the founding professor of microbiology at the Australian National University's John Curtin School of Medical Research in 1949, Professor Fenner became the director of the school from 1967 to 1973. He left that position to become the founding director of the university's Centre for Resource and Environmental Studies. Professor Fenner retired in 1979 but continues his research as a visiting fellow in the John Curtin School.

Throughout his career, Professor Fenner's late wife Bobbie was both an assistant, working with him in the early days as a technical assistant, and a companion, sharing an avid interest in gardening and entertaining students and scholars from around the world.

Professor Fenner has been interviewed as part of the Academy's Video Histories of Australian Scientists project. An edited transcript of the interview is available at [www.science.org.au/scientists/ff.htm](http://www.science.org.au/scientists/ff.htm).

Another associate of the Academy, **Ms Ruth Dircks**, won the inaugural Prime Minister's Prize for Excellence in Science Teaching in Secondary Schools. Ruth began her association

with the Academy in 1981 during the production of the third edition of the Academy's landmark biology text, *The Web of Life*. She continued to work with the Academy as project director of two further Academy texts, *Disease and Society* and *Biology: The Common Threads*. In 1990 Ruth Dircks was awarded a Medal of the Order of Australia for her contributions to science education. She is currently teaching at Dungog High School in New South Wales.

The winner of the Malcolm McIntosh Prize for physical scientist of the year, **Professor Marcela Bilek** of the University of Sydney, is another scientist interviewed in the Video Histories of Australian Scientists project. An edited transcript of the interview is available at [www.science.org.au/scientists/mb.htm](http://www.science.org.au/scientists/mb.htm).

**Dr Joel Mackay**, also of the University of Sydney, won the Science Minister's Prize for achievement in the life sciences. Dr Mackay was recently interviewed for the Video Histories of Australian Scientists project and the transcript will be available on the Academy's website in the near future.

## Forthcoming events

- Australian Foundation for Science open session and annual general meeting, 18 November 2002

## New topics on Nova

- The shocking truth about road trauma
- Ethnomathematics – a rich cultural diversity
- GPS and never having to say: 'Where am I?'

[www.science.org.au/nova](http://www.science.org.au/nova)

## Award deadlines 2002

Flinders Medal	8 November
Award for Research on the Conservation of Endangered Australian Vertebrate Species	22 November
Kanagawa Museum Award	28 November

For more information see [www.science.org.au/awards/awards.htm](http://www.science.org.au/awards/awards.htm).

## International exchanges

For information on deadlines see [www.science.org.au/internat/index.htm](http://www.science.org.au/internat/index.htm).

## Basser Library

Anyone wishing to use the Basser Library should contact the librarian, Rosanne Walker, telephone (02) 6247 9024 or email [lb@science.org.au](mailto:lb@science.org.au).

## Gifts to the Academy

If you would like to make a gift or a bequest to the Academy of Science or the Australian Foundation for Science, please contact the Executive Secretary, telephone (02) 6247 5777 or email [es@science.org.au](mailto:es@science.org.au).

# Major research facilities

The Academy has been preparing policy recommendations for the funding of Australia's scientific research infrastructure and, in particular, major research facilities.

The project, which builds on earlier work by the Academy, has received a special projects grant from the Australian Research Council and is looking at current infrastructure programs, areas of need, international collaboration and overseas policy approaches. This will lead to recommendations on ways to change Australia's research infrastructure programs and their funding.

A discussion paper, *Providing the machinery of science*, was circulated by the Academy in August. It defines a strategy for securing access to critical research facilities. As well as enabling advances in fundamental knowledge, such facilities can increase the speed and reduce the cost of research by more accurately predicting the results of experiments and by carrying out analyses more quickly and cheaply

than is possible with older vintages (for example, machines that automatically sequence DNA).

As well as building major facilities in Australia, one of the most significant ways to gain access to them is to take advantage of other countries' investments in infrastructure, at less than the full cost. Such international research collaboration depends on Australian scientists having ideas and expertise which their collaborators value, and skills and experience to use advanced scientific instruments. It also depends on Australia having major facilities attractive to overseas researchers; these assets can be used to negotiate access to other countries' facilities.

If Australia fails to invest in these assets and in coordinating how they are used in international negotiations, then the efficiency of our research (about 1 per cent of global research and development expenditure, producing about 2 per cent of global scientific publications) could drop.

The Commonwealth Department of Education, Science and Training already runs a major national research facilities program. The Academy is contacting those who have made unsuccessful bids to the program, in an attempt to identify needs that have not been met. In December the Academy will hold a workshop in order that the scientists funded by the program can share ideas on managing a major research facility and assist the Academy to make the case for more coherent funding of facilities.

In its 2001 *Statement on Priorities for the Next Australian Government*, the Academy stated that 'the ad hoc nature of the major national research facilities program must end by inclusion of a one-line budget item in the science and technology budget each year, even if there are competitive rounds on a less frequent basis than annual.'

Further information on the infrastructure project and a copy of the full discussion paper are available at [www.science.org.au/policy/arip.htm](http://www.science.org.au/policy/arip.htm).

## Review of school science teaching

School teaching suffers from a poor public image. The profession is perceived as burnt out, underpaid and struggling to cope with student welfare and discipline, according to an Academy response to a Commonwealth government discussion paper.

The Department of Education, Science and Training is conducting a review of teaching and teacher education. It is particularly looking for strategies to attract and retain teachers of science, technology and mathematics.

In the Academy's submission, the Secretary (Education and Public Awareness), Professor John McKenzie, stated, 'Professional, well educated and excellently resourced and supported teachers of science, technology and mathematics are critical to a future that is secure, prosperous and sustainable.'

A high-quality teaching workforce should be a national priority. 'The presence of an inspiring, high-quality teacher in the classroom is the single

most important factor in improving student achievement in, and enjoyment of, primary and secondary school,' said Professor McKenzie.

A key issue was the resourcing of teachers as professionals. This needed to include the physical conditions within school laboratories, technical support, appropriate class size, in-service training and the opportunity for professional development.

The Academy's submission made a number of proposals for attracting people to careers in teaching science, technology and mathematics, and retaining teachers. It also suggested national collaboration in curriculum resources, assessment and professional development.

The submission expressed concern at the shortage of well-qualified teachers in the enabling sciences (mathematics, physics and chemistry).

The full submission is available at [www.science.org.au/academy/media/4October02.htm](http://www.science.org.au/academy/media/4October02.htm).

## Federation Fellowships

In July the Commonwealth government announced the second round of Federation Fellowships, designed to attract and retain leading scientists in Australia. The fellowships pay the scientists \$225 000 per year for five years.

Four of the 11 fellowships went to Fellows of the Academy:

- Professor Ron Ekers, Director of the Australia Telescope
- Professor Terry Hughes, a marine biologist at James Cook University
- Professor Yuri Kivshar, from the Nonlinear Physics Group at the Australian National University
- Professor Rodney Tucker, a photonics scientist at the University of Melbourne.

The President of the Academy, Dr Jim Peacock, said that the fellowships are important because they indicate that the government understands that research and innovation underpin the nation's future well-being.

# High fliers suggest priorities

During the year the Commonwealth government has been developing national priorities for research. As reported in the last newsletter, the Academy has played a leading role in coordinating consultations with the four learned Academies. In another contribution to this endeavour the Academy brought together 18 young scientists and a number of Fellows at a workshop, held in Canberra in August.

The young scientists were high fliers in their fields, a number of whom had won Academy medals for their research. The aim was to gain ideas for priorities that might reflect a different view from those of more established scientists.

The Academy's Secretary (Science Policy), Professor Michael Barber, chaired the workshop. Dr Joanne Daly, from the Department of Education, Science and Training, described the process of setting priorities before the scientists broke into three groups – healthy, wealthy and wise – to work on ideas.

In the afternoon the participants came back together for a lively discussion of suggestions. Four broad topics became the subjects for research priorities:

- sustainable wealth generation
- a healthy people
- a healthy country
- smart tools for research and industry.

Over the following two weeks a small group refined the submissions on these topics. They were then forwarded to the Department of Education, Science and Training.

Copies of the high fliers' submissions are available at [www.science.org.au/proceedings/priorities/highfly.htm](http://www.science.org.au/proceedings/priorities/highfly.htm).

## National committees

Four of the Academy's national committees also made submissions on research priorities. The National Committee for Earth Sciences suggested *Sustainability of societal support systems* – maintaining the environmental support systems for Australian society, and *National security for individual liberty* – maintaining and enhancing national security in non-invasive ways that protect the liberty

of the individual.

The National Committee for Crystallography recommended *Structure-based research at the atomic level using major national facilities* – maintaining access to overseas facilities and building a synchrotron and new research reactor in Australia.

The National Committee for Mathematics nominated *The mathematical sciences* as a national priority as they underpin Australia's advances in a very wide range of strategically important, contemporary research areas. The National Committee for Astronomy suggested *Strengthening Australia's base in sciences*

*that enable tomorrow's technology.*

These submissions are available from the department's website at [www.dest.gov.au/priorities/sub\\_priorities.htm](http://www.dest.gov.au/priorities/sub_priorities.htm) (submission number 66).

## Advisory committee

The Commonwealth government has formed an Expert Advisory Committee to advise it on national research priorities. The President of the Academy, Dr Jim Peacock, chairs the committee and four other Fellows – Dr Robin Batterham, Professor Suzanne Cory, Professor Terry Hughes and Professor Sue O'Reilly – are members.

## National Committees

As well as putting together submissions on national research priorities (see above), the Academy's national committees have been working to support their disciplines.

The Academy has put together the biennial report from the National Committee on Space Research to the World Science Council's Committee on Space Research (COSPAR). The report was assembled from contributions from the wide range of institutions undertaking space-related research in Australia. It covers the period between

COSPAR scientific assemblies, in this case from July 2000 to June 2002. The 34th COSPAR meeting was held in Houston from 10 to 19 October 2002. The Chair of the National Committee on Space Research, Professor Peter Dyson, tabled the report at this assembly.

The National Committee for Astronomy met at Ian Potter House on 15 August. The committee is chaired by Associate Professor Rachel Webster, from the University of Melbourne.



The National Committee for Geography met at the Academy on 6 September 2002. From left: Professor Ruth Fincher, Professor Iain Hay, Professor Jim Walmsley, Dr Richard Baker, Dr Iraphe Childs, Mr Graham Baker, Dr Geoff Conolly and Professor David Gillieson (Chair).

# Greenhouse science review

The Australian Greenhouse Office has been reviewing its greenhouse science program. As part of the review the Academy made a submission on the part of the program for which it is responsible – Australian involvement in the International Geosphere–Biosphere Programme and the World Climate Research Programme.

Membership of these international programs allows Australia to provide scientific input to research frameworks and policy agendas, for example, assessments of the Intergovernmental Panel on Climate Change.

The Academy's submission said that participation in the international programs had led to major improvements in climate models, particularly those that coupled the oceans and the atmosphere. Complexities such as aerosols and biospheric interaction had been incorporated into the models. The observation of parameters related

to the greenhouse effect had also improved.

Better models meant better predictions of regional climate variability, such as the effects of El Niño. Scientists had also learnt more about the effects of global temperature changes on ecosystems.

Australian scientists had taken a leading role in international research programs and provided a basis for international policy negotiations.

There was still a need to learn more about the natural climate variability of the last 10 000 years and to develop regional models of climate change impacts. There was also a need for more interdisciplinary research in climate change, particularly integrating the social sciences.

## Building links

In July the Academy hosted a round table discussion with the Chair of the

Intergovernmental Panel on Climate Change, Dr Rajendra Pachauri, during his visit to Canberra. The head of the Bureau of Meteorology, Dr John Zillman, chaired the meeting. Professor Graham Farquhar and Professor Sue Serjeantson represented the Academy.

The role of the panel is to assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change. It does not carry out research nor does it monitor climate-related data or other relevant parameters. It bases its assessment mainly on peer-reviewed and published scientific and technical literature.

Dr Pachauri sought comments on ways the panel could become more relevant. Suggestions included a forum to target climate change sceptics, the use of official statistics for reporting, and ways of establishing better links with industry.

## School science projects

The Academy is actively involved in a number of national school science programs. The Collaborative Australian Secondary Science Project, managed by Curriculum Corporation, is developing a professional development program and a set of classroom resources which aim to change the way teachers teach junior secondary science. The project has already been trialled in 28 schools across Australia. Fellows of the Academy are checking the scientific integrity of the resources. Professor Tony Klein has reviewed the trial materials for a Year 9 energy unit.

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. Fellows will again be involved in reviewing this material.

The Primary Science Assessment Project is developing a set of performance assessment items in science for Year 6 students. Again, Fellows of the Academy will be contributing to the project by reviewing the scientific accuracy of the assessment items.

## Academy maintains support for stem cell research

In recent months there have been scientific developments in human embryonic stem cell research and lively debate about the subject – in federal Parliament and elsewhere. The Academy has continued to support the research through public statements and contact with politicians.

The Academy's spokesperson on the subject, Professor John White, has said again that the Academy is opposed to cloning whole human beings. 'But Australia must not close the door on research into human embryonic stem cells.

'It is difficult to legislate effectively in an area of rapidly developing technology. Legislation can set limits on certain research practices, such as prohibiting the cloning of whole human beings, but should not regulate the details of research in human stem cells.

'We need research in both embryonic and adult stem cells. The work goes hand-in-hand.'

The recent developments in stem cell research show the importance of undertaking basic research in cell

biology prior to clinical application of that research. The research could lead to treatments for major degenerative diseases.

Professor White said, 'Australia can be a world leader in stem cell research. We must not hinder legitimate work in this area, as long as it is approved by institutional ethics committees.'

## Antarctic art

Academy Fellow, Dr Liz Truswell, a Visiting Fellow in the Department of Geology at the Australian National University, has donated an artwork to the department. The work, in charcoal on a photocopied research paper, depicts an ancient forest in East Antarctica. The image of the trees is based on pollen samples taken from sediment cores.

Dr Truswell, who is a graduate of Canberra School of Art, told *ANU Reporter*, 'I wanted to recreate a sense of mystery and to bring the languages of art and science together.'

## Risk and R&D

The Academy is endeavouring to raise the profile of risk management as applied to the business research and development (R&D) tax concession.

This perspective was discussed in a submission to the House of Representatives Standing Committee on Science and Innovation in August and at a later appearance before the committee. The committee is inquiring into business commitment to research and development.

The Academy's Secretary (Science Policy), Professor Michael Barber, told the committee that 'the level of business investment in research and development in Australia remains one of the most serious weaknesses in the Australian innovation system'. He said that this could not be allowed to continue if we wished to maintain the sort of economy and society to which

Australians aspired.

The Academy's suggestion is that more effective investment risk management would help small and medium-sized businesses to increase their investment in R&D. Consideration of risk management could also benefit the public sector.

The Academy endorsed the existing policy that R&D projects should require *either* an appreciable element of novelty *or* high technical risk to be eligible for the tax concession. This encourages the lower risk, incremental approaches to innovation that are likely to contribute to sustainable increases in business R&D investment.

The submission argued that government support for R&D should be based on improving the capacity of a firm to manage this type of investment risk. Firms could learn from

their experience with lower risk R&D investments before leaping to higher risk, higher value-added projects. In the future small companies would be more receptive to the scientific advances made in universities and other research organisations because they would be better placed to anticipate and deal with the inevitable technical and commercial problems that emerge.

This improvement in the capacity to effectively manage R&D projects would in turn help to improve the social return on public sector investment in research.

The full submission is available at [www.aph.gov.au/house/committee/scin/randd/subslist.htm](http://www.aph.gov.au/house/committee/scin/randd/subslist.htm) (submission number 45).

## The International Council for Science

The International Council for Science is a non-government organisation that promotes scientific activity and brings together scientists in different disciplines and different countries. The Academy represents Australia on the council.

The international body evolved from the International Association of Academies, which was founded in 1899, through the International Research Council. It was formerly known as the International Council of Scientific Unions.

The council has two sorts of members: national scientific academies or research councils, and international, disciplinary scientific unions. It is also affiliated with a number of regional scientific organisations.

The council organises research programs such as the International Geosphere-Biosphere Programme. It also establishes interdisciplinary bodies which undertake policy work and research.

The council tries to identify areas of science which need strengthening. It has vigorously promoted science education, access to scientific data, ethics, and the rights and freedoms of scientists. The council also acts as a focus for the exchange of ideas, the communication of scientific information and the development of



Graeme Pearman, right, addressing the general assembly of the International Council for Science. Council officials, pictured from left, are H Kleinkauf, Vice-President for External Relations; T Bahmani Fard, Assistant Executive Director; T Rosswall, Executive Director; H Yoshikawa, outgoing President; H A Mooney, Secretary-General; J Lubchenko, incoming President; Y Verhasselt, Treasurer; Cathage Smith, Deputy Executive Director.

scientific standards.

The 27th general assembly of the council and associated meetings were held in Rio de Janeiro from 20 to 28 September 2002. Academy Fellow, Dr Graeme Pearman, reported to the general assembly on the recommendations for the council's Committee on Scientific Planning and Review. This committee was created in

1998 to advise the executive board of the council on priorities for scientific initiatives and to review activities of the council's scientific interdisciplinary bodies. Its report is available at [www.icsu.org/](http://www.icsu.org/).

The Executive Secretary, Professor Sue Serjeantson, also attended. The next general assembly will be held in China in 2005.



At the Photonic crystals down under conference. From left: Ian Chubb, Vice-Chancellor of the Australian National University; Peter McGauran, Minister for Science; and Erich Weigold, Director of the Research School of Physical Sciences and Engineering, Australian National University.

## Fenner conference on agriculture

Many scientists and farmers are seeking a system of Australian agriculture that is more compatible with Australia's society, economy and biophysical environment than the current system. More than 230 delegates, including farmers, scientists and policy makers, met in Canberra at Rydges (Lakeside) Hotel from 31 July to 2 August 2002 to discuss this prospect.

The occasion was a Fenner Conference on the Environment, with the theme *Agriculture for the Australian environment*. The mixture of delegates enhanced the debates on topics such as the future of Australian agriculture, community redesign, social and economic features of agriculture, and sustainable farming.

The organiser of the conference, Dr Ben Wilson, from the School of Environmental and Information Sciences at Charles Sturt University in Albury, said, 'This was clearly a different conference from the usual academic and scientific conferences many of us are more at home with. Most delegates were taken out of their comfort zones and encouraged to look at the bigger picture.'

Over 70 papers were presented and six workshops were formed, based on six regions. Expert facilitators raised many issues and led good-humoured debate. One farmer said, 'The shakers and movers are surprisingly human at close range and I believe an enormous amount was achieved to everyone's benefit with the development of empathy for the other's position.'

Dr Wilson said the main achievement of the conference was encouraging greater interaction between people with different perspectives. 'While much ground was covered trying to find Australian solutions to the challenges of agriculture in this country, it was only part of a much larger process that I hope will continue post-conference.'

The Fenner Conferences on the Environment are made possible by a gift from Professor Frank Fenner and the late Mrs Bobbie Fenner.

## New light on photonics

Optic fibres using light (photons) rather than electricity to transmit signals through cables have revolutionised communications and stimulated the science of photonics. The next step is the development of photonic crystals that use light to switch and process signals, as silicon chips use electrons. The photonic crystals would be semiconductors of light.

Some of the great minds working on this challenge around the world came together in August at the first conference of the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series. The conference, called *Photonic crystals down under*, was hosted by the Academy and the Australian National University, funded by the Commonwealth Department of Education, Science and Training, and organised by Professor Yuri Kivshar, from the Australian National University.

The opening speaker was one of the

pioneers of photonics, Professor Sajeev John, from the University of Toronto in Canada. He said the 20th century was the age of materials, particularly the semiconductors that have made electronics possible. He suggested that the 21st century would be the age of photonics, where artificial materials would microscopically manipulate the flow of laser light. He discussed the consequences for basic science, communications and computing.

Many other applications of photonic crystals were mentioned at the conference: antennas, solar cells, lasers, light emitting diodes, sensors, information storage.

Other speakers came from Britain, the USA, Japan, Hong Kong, Germany, India and around Australia. They discussed the structure and properties of photonic crystals, the use of silicon and polymers rather than glass to make optic devices, and methods of manufacturing cheaper, smaller, more integrated optical components.

# Boden conferences on skin and insects

Two Boden research conferences were held this year, bringing together Australian and overseas researchers for meetings on specialised subjects. The conferences are sponsored by the Academy from a bequest made by the late Dr Alexander Boden.

## Skin biology

Between 14 and 18 April about 75 scientists, 12 from overseas, met at Stradbroke Island near Brisbane to discuss *Developmental cutaneous biology*. They shared information about the development of skin structures, stem cell biology, skin differentiation, gene regulation, skin disorders, skin cancer, wound healing, tissue engineering and gene therapy.

The conference was organised jointly by Dr Pritinder Kaur, from the Peter MacCallum Cancer Institute in Melbourne, and Dr Joseph Rothnagel, from the University of Queensland. The meeting was also supported by international companies and scientific societies.

The invited overseas speakers provided a number of highlights of the meeting. Dr Yann Barrandon, from Switzerland, presented his latest work on stem cells of the hair follicle. Dr Dennis Roop, from the USA, talked about his work on animal models of skin disease. Dr Andrzej Dlugosz, from the USA, discussed his research

into the role of the sonic hedgehog gene in hair follicle development and cancer. Dr Stuart Yuspa, from the USA, presented work on signalling pathways and the progression of skin cancer. The high standard of the overseas speakers was matched by excellent presentations from Australian scientists.

The program was structured to permit extensive discussion after the talks and informal interaction between sessions. Nineteen pieces of original research were displayed in a poster session.

Dr Kaur said, 'Ultimately the meeting provided a showcase to promote awareness of Australian research in the cutaneous biology field, while promoting interactions at a scientific and personal level with high-calibre overseas and Australian investigators.'

## Insect genomics

A Boden conference on applied insect genomics was held in Brisbane from 4 to 6 July. The conference brought together applied and basic research entomologists to encourage the application of the latest genomic tools to solving practical problems relating to the control of insect pests.

A major focus of the conference was a discussion of applied pesticide resistance problems as well as the genetic understanding of such

problems. Progress has been made toward understanding the way *Heliothis*, the major insect pest of field crops, may develop resistance towards BT, a biological control agent grown in genetically modified cotton and used on a variety of crops.

Similar progress has been made towards understanding the genetic mechanisms of resistance of pests to phosphine fumigation of stored grain. As a result of the meeting, a collaborative research team has been established to study a highly resistant whitefly from California, an emerging pest of potentially great significance.

Traps and lures are used effectively in horticulture to control fruit flies. The use of odour detection by insects to find hosts was discussed from basic and applied perspectives.

Lice, veterinary parasites and mosquito control were also discussed. One talk proposed a way to deliver transgenes into insect populations to control the spread of disease.

Data on invertebrate genomes is accumulating rapidly. The genome sequences for *Heliothis* and a mosquito have been completed this year. A plan to sequence the honey bee genome was announced at the meeting. Efforts in Australia and New Zealand to build genome resources for key pests and model insects were described and means for disseminating information and reagents were discussed.



Two representatives from the National Center for Genetic Engineering and Biotechnology in Thailand, Mayures Ua-Malachat, second from left, and Dussadee Siamhan, second from right, visited the Academy in August. They are pictured with the Academy's international relations officer, Nancy Pritchard, left, and the international assistant, Amanda Kemmerer.

## Conservation plan for Ian Potter House

The Academy has received a \$10 000 grant from the ACT Heritage Unit to develop a conservation management plan for Ian Potter House, the heritage-listed building that houses its Secretariat in Canberra. Heritage consultants, John Armes and Associates, have been engaged to develop the plan.

The development of a conservation management plan is the required first step before works can be carried out on a heritage-listed building. A recent building audit has indicated that Ian Potter House is in need of re-roofing. The conservation management plan will guide the re-roofing and other future works needed on the building.

# Rees Lecture on microscopic world

The Lloyd Rees Lecture for 2002 was delivered by Professor David Cockayne in Melbourne on 26 September on the topic 'Exploring the nanoworld – adventure or investment'.

This was the sixth in the series of biennial lectures to commemorate the life and work of Dr Lloyd Rees, foundation Chief of the CSIRO Division of Chemical Physics from 1958 to 1978.

Professor Cockayne, a Fellow of the Royal Society, is distinguished for his major contributions to chemical physics in the areas of high-resolution electron microscopy, electron diffraction and microanalysis. He started his research career at the University of Melbourne, when he spent periods of time working at the CSIRO Division of Chemical Physics laboratory of Lloyd Rees. He was a research fellow at Oxford University and gained a DPhil in 1970.

At the University of Sydney he was Director of the Electron Microscopy Unit for a number of years and in 2000 returned to Oxford as professor of the physical examination of materials in the Department of Materials.

In the lecture, Professor Cockayne described how exploration in the nanoworld had led to groundbreaking discoveries in the biological and physical sciences – carbon nanotubes, the growth and self-organisation of quantum dots, and the three-dimensional structure of macromolecular machines. Modern electron microscopes with few aberrations, rapid data collection and formidable computing power allow experiments which would have seemed impossible a few years ago.

He said the microscopes give us the opportunity to see and to build at the atomic level. Scientists become architects, designing new materials with new properties. To explore and construct in this nanoworld requires a high order of physical and intellectual infrastructure. This is expensive. Professor Cockayne reiterated a point made by Lloyd Rees: those societies which invest in instrumentation and the intellectual resources required to develop and use it will reap the rewards.



*Pictured at the Rees Lecture in Melbourne, from left, Fellows Peter Hannaford and Bruce McKellar; Marion Rees, Lloyd's widow; and David Cockayne.*

## Honours to Fellows

The Victorian government has awarded its 2002 Victoria Prize to **Professor David Boger**, professor of chemical engineering at the University of Melbourne. The award is made for leadership in science, engineering or technological innovation.

The Royal Society of London has awarded its Royal Medal to **Professor Suzanne Cory**, the Director of the Walter and Eliza Hall Institute of Medical Research in Melbourne. The award, given to three Commonwealth scientists each year, recognises her research achievements in immunology and cancer.

The Australian Institute of Physics has awarded its 2002 Harrie Massey Medal to **Professor Robert Delbourgo**, a particle physicist from the University of Tasmania. The medal is awarded every two years for contributions to physics or its applications.

Macquarie University has awarded its 2002 Moyal Medal to **Professor Alan McIntosh**, of the Centre for Mathematics and its Applications at the Australian National University, for his research in harmonic analysis and partial differential equations.

The University of Melbourne has appointed **Professors Colin Masters, Marilyn Renfree and Rodney Tucker** as Laureate Professors. The appointment recognises research and scholarship of the highest international calibre. Professor Masters is head of the Department of Pathology, Professor Renfree is head of the Department of Zoology and Professor Tucker is Director of the Australian Research Council Special Research Centre for Ultra-Broadband Information Networks.

Her Majesty Queen Elizabeth II has appointed **Lord May of Oxford** a member of the Order of Merit. The order recognises exceptional distinction in the arts, learning, sciences and other areas.

# Deaths

## Geoffrey Badger

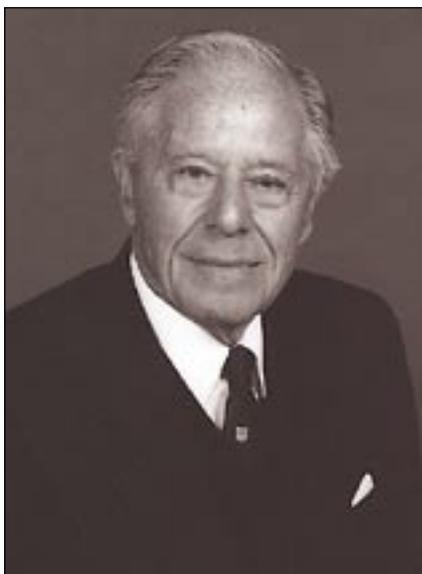
Geoffrey Malcolm Badger was born in Port Augusta, South Australia, on 10 October 1916 and died in Adelaide on 23 September 2002. He was educated at Geelong College, Gordon Institute of Technology, the University of Melbourne and the Chester Beatty Research Institute, University of London, where he obtained his PhD.

After research positions in Manchester and Glasgow, interspersed with three years in the Royal Navy, he came back to Australia in 1949 to take up a post as senior lecturer at the University of Adelaide, progressing to professor of organic chemistry from 1955 to 1964. He then had a brief spell as a member of the CSIRO Executive, returning to the University of Adelaide in 1966 as Deputy Vice-Chancellor for six months before becoming Vice-Chancellor, a position he held for 10 years.

Geoff was one of the original members of the Australian Research Grants Committee. He was elected to the Academy in 1960 and served on the Council for 11 years, taking on two executive positions, as Secretary (Physical Sciences) from 1968 to 1972 and President from 1974 to 1978. He also played a role in the formation of the National Science and Industry Forum, a group that advocated setting up a committee to advise the government on expenditure for science and technology. This advisory committee eventually became a permanent body, the Australian Science and Technology Council, and Geoff served as the first Chairman from 1977 to 1982.

Much of Geoff's early research involved cancer-producing compounds, synthesising substances which tested both for cancer-producing activity and for inhibition of tumours. He continued this research on his return to Australia, as well as examining chemicals from plants for their biological activity. He also examined the absorption spectra of some groups of organic compounds and developed methods for the synthesis of higher fatty acids.

Geoff received a number of honours, including both the H G Smith Medal and the A E Leighton Medal from the Royal Australian Chemical Institute, the W D Chapman Medal from the



Geoff Badger in 1998

Institution of Engineers Australia, the ANZAAS Medal and election as a Fellow of the Australian Academy of Technological Sciences. He was made an Officer of the Order of Australia in 1975 and was knighted in 1979.

He is survived by his wife, Lady Edith.

The edited transcript of a video interview with Geoff is available at [www.science.org.au/scientists/gb.htm](http://www.science.org.au/scientists/gb.htm).

## Archie McIntyre

Archibald Keverall McIntyre was born in Edinburgh on 1 May 1913 and died in Hobart on 20 July 2002. He was the grandson of Sir Edgeworth David, who was professor of geology at the University of Sydney from 1891 to 1924 and a member of the second British Antarctic Expedition from 1907 to 1909.

Archie began a science degree at the University of Sydney at the age of 16 but transferred to medicine in second year. After a year as a resident at the Royal Prince Alfred Hospital he undertook studies on the sense of balance at the University of Sydney. These studies were to prove useful to him when he joined the Royal Australian Air Force, as he was able to develop a method of selecting air sickness-prone subjects, who were then excluded from training as pilots.

After the war he spent two years at the Rockefeller Institute in New York, where he worked on the tendon jerk. He then took up an offer from

Jack (later Sir John) Eccles of a senior lectureship at the University of Otago, New Zealand. He worked briefly with Eccles on chromatolysis in motoneurons and on disuse. He also built equipment for recording from spinal neurones with microelectrodes and Eccles used this equipment for his Nobel prize-winning experiments.

Archie was professor of physiology at the University of Otago from 1951 to 1961. During this period he spent six months in Salt Lake City, Utah, where he carried out work on sensory receptors that led to three landmark papers.

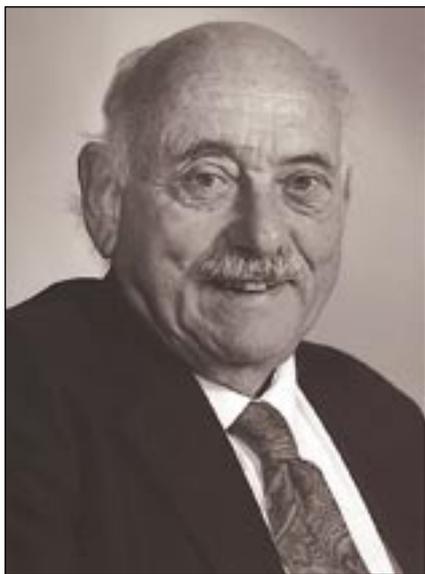
Archie returned to Australia in 1962 as professor of physiology at Monash University, a post he held until his retirement in 1978, when he settled in Launceston. At Monash he was part of a group which discovered electroreceptors in the platypus bill and later in the echidna snout.

In 1963 he was elected as a Fellow of the Academy and served as Secretary (Biological Sciences) from 1970 to 1974. The Australian Physiological and Pharmacological Society established the A K McIntyre Prize in his honour in 1994. This is awarded to members for significant contributions to Australian physiological or pharmacological science during their predoctoral and early postdoctoral years.

He is survived by his wife, Anne; his sons, Michael and Richard; and his daughter, Margaret.



Archie McIntyre in 1988



Bernhard Neumann in 1993

## Bernhard Neumann

Bernhard Hermann Neumann was born in Berlin on 15 October 1909 and died in Canberra on 21 October 2002. After receiving his DrPhil from the University of Berlin in 1932 he moved to England in 1933 and did another doctorate at Cambridge. He then worked for three years as a temporary assistant lecturer at the University College, Cardiff. During this period his fiancée, Hanna von Caemmerer, arrived from Germany to marry him.

In 1940 he was interned for several months and then allowed to volunteer for the British Army, where he served in the Pioneer Corps, the Artillery and the Intelligence Corps, ending with a spell in Germany.

On his return to England early in 1946 he became a lecturer at University College, Hull, where Hanna was also successful in finding a lecturing job in the same department later that year. In October 1948 Bernhard moved on to a post as lecturer at the University of Manchester. He stayed there until 1961, by which stage he was a Reader in Mathematics.

In 1962, after a visit to Australia, Bernhard was offered a position as professor and head of the Department of Mathematics at the Australian National University but was persuaded to take it up only when Hanna was also offered a position. As he put it, 'We are a housekeeper-gardener couple.'

Bernhard held this position from

1962 until his retirement in 1974, when he was made an emeritus professor of the university. Even during his so-called retirement he continued to ride his bicycle to his two honorary jobs, at the Australian National University and at CSIRO Mathematical and Information Sciences.

Hanna and Bernhard had very similar mathematical interests, producing a number of joint papers in group theory and abstract algebra. After her death in 1971, Bernhard established the Hanna Neumann Memorial Fund.

Bernhard was very interested in the promotion of mathematics, being largely responsible for the introduction of the Australian Mathematics Olympiad for high school students.

Many honours came Bernhard's way, in particular election as a Fellow of the Royal Society in 1959 and of the Academy in 1964, delivery of the Academy's Matthew Flinders Lecture in 1984 and receipt of a number of honorary doctorates. In 1994 he was appointed a Companion of the Order of Australia.

In 1973 Bernhard married Dorothea Zeim, who survives him, together with the five children of his first marriage, Irene, Peter, Barbara, Walter and Daniel.

The edited transcript of a video interview with Bernhard is available at [www.science.org.au/scientists/bn.htm](http://www.science.org.au/scientists/bn.htm).

## Ian Thornton

Ian Walter Boothroyd Thornton was born in Halifax, UK, on 14 July 1926. He died in Bangkok on 1 October 2002 on his way back to Australia from a field trip to Laos where he was advising on a course in the National University of Laos.

After serving in the British Army from 1944 to 1948 he studied at the University of Leeds, where he was awarded a PhD in insect ecology in 1953.

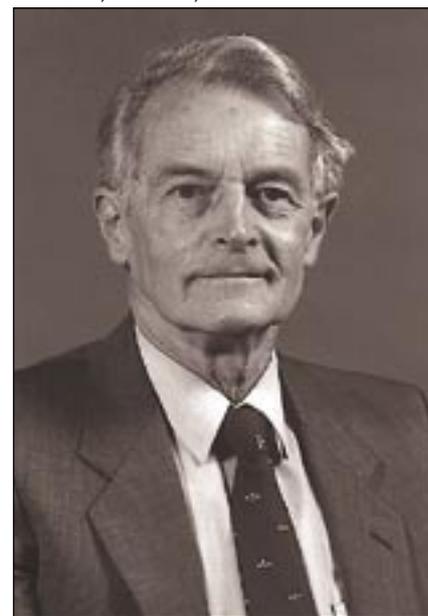
He then moved to the University College of Khartoum in Sudan, where he lectured in zoology for three years, taking up a senior lectureship at the University of Hong Kong in 1956. In 1968 he became foundation professor of zoology at La Trobe University, a position he held until his retirement in 1991, when he was made a professor emeritus.

His career divides broadly into three periods. His initial graduate work in Britain and the Sudan established his interest in the biology of the Psocoptera. He extended his research into the systematics and biogeography of the Psocoptera of the oriental region and Micronesia from a base in Hong Kong. On his appointment to the Chair of Zoology at La Trobe University he added Melanesia, Australasia and South America to his areas of interest. From this research came *Darwin's islands: a natural history of the Galápagos*, published in 1971. The Galápagos Islands were also the topic of a number of Ian's external lectures.

His final major area of research was on the re-colonisation of Krakatau and Anak Krakatau, where from 1980 he led a team undertaking the most intensive study carried out on the recolonisation by animals of these islands. His work there challenged pre-existing theories of island biogeography and the evolution of isolated biotas and led to the publication of a book, *Krakatau: the destruction and reassembly of an island ecosystem*, in 1996.

Ian was elected to Fellowship of the Academy in 1995. He served as a member of the Academy's Sectional Committee on Animal Sciences from 1996 to 2000.

He is survived by his first wife, Jean; their children, Angus and Jane; his second wife, Ann; and his step-children, Belinda, Benita and Tim.



Ian Thornton in 1996



The Selby Fellow, Leonard Smith, left, and Joe Gani, the Academy's host for the Selby lecture in Canberra.

## SELBY FELLOWSHIP

# Chaos in climate forecasting

One of the distinguishing traits of science is its fundamental acceptance of uncertainty. Interest in chaos and non-linear phenomena has led to insights into what can be accurately forecast.

The Academy's 2002 Selby Fellow, Dr Leonard Smith, delivered lectures and workshops on this subject around Australia in July and August. Dr Smith, a mathematician from Oxford University, put the concepts of uncertainty and chaos in historical perspective. He showed the development of weather forecasting in the more ambitious context of climate modelling.

Dr Smith, originally from Florida, has conducted research into the dynamics of physical systems, numerical approximations of physical systems, limits to predictability, and applications to industry, economics, natural systems and electricity demand forecasting. He has held research positions in Britain, Germany and France. He is co-director of the Centre for the Analysis of Time Series at the London School of Economics.

He gave talks in Brisbane, Sydney, Canberra, Melbourne, Hobart, Perth and Darwin.



A meeting of the Europe Exchange Committee on 20 September 2002 considers applications for scientific visits. From left: Academy Fellow Rod Rickards; Alain Moulet, Science and Technology Attaché, French Embassy; Jean-Françoise Desvignes, French Embassy; and another Fellow, Neville Fletcher. Other members of the committee present but not pictured were Academy Fellows, Phil Kuchel and Ross Taylor; Peter Cook, Foreign Secretary, Australian Academy of Technological Sciences and Engineering; and Pascal Perez, Chair, French Embassy Exchange Committee.

# Bede Morris Fellow takes on acid soils

The Academy's Bede Morris Fellow for 2003–4 will be Professor Zed Rengel, the head of the Department of Soil Science and Plant Nutrition at the University of Western Australia. The fellowship allows an Australian scientist to visit France to further their studies. Professor Rengel will visit the soil and environment research centre in Montpellier in 2004.

Up to 70 per cent of arable soils in the world are acidic, with aluminium toxicity limiting crop yields. Aluminium toxicity and soil acidity can be ameliorated by adding calcium (as lime) to the soil, but this is often too expensive for low-input low-output Australian agriculture. An alternative approach may be to supply small amounts of calcium, as fertiliser, to the root zone of plants.

Professor Rengel has worked for many years to find out how calcium and aluminium interact in cells and why aluminium is toxic to plants. In France he will use microelectrodes to measure calcium uptake by intact root cells from the soil around them. This will help understanding of the mechanisms of aluminium toxicity and plant tolerance of aluminium. Better

understanding would allow the design of more sustainable farms and more aluminium-tolerant crop plants.

Professor Rengel is already collaborating with Dr Philippe Hinsinger of the Montpellier research group on an Australian–French program on the adaptation of plants and symbioses to physical and chemical constraints of soils in Mediterranean environments.

## National Science Week

The Academy was involved in a number of events during National Science Week in August. The Executive Secretary, Professor Sue Serjeantson, participated in a hypothetical debate at the Australian National University on stem cell research and judged a competition on genetics. Professor Serjeantson also travelled to Mount Gambier in South Australia to take part in Science in the Bush.

*Australian Science Stories*, a series of excerpts from the Video Histories of Australian Scientists project, was shown to school students in the Shine Dome.