



## Business innovation in decline

The Presidents of Australia's two science and technology academies have expressed alarm and dismay at reported declines in business spending on research and development.

In a joint statement in July, Professor Brian Anderson, President of the Academy of Science, and Mr Tim Besley, President of the Academy of Technological Sciences and Engineering, said Australia is in danger of undoing the gains of earlier years.

The Australian Bureau of Statistics found that, after five years of growth at 13 per cent, in 1996–97 research spending fell by 7 per cent. The figures showed that research spending by business was likely to decline by another 8 per cent in 1997–98.

Professor Anderson and Mr Besley stated, 'This is a precipitous decline, simply incompatible with Australia's aspiration to be a prosperous, globally competitive economy. It is principally

due to the government decision to reduce the taxation concession from 150 per cent to 125 per cent.'

A private survey by the Business Council of Australia has predicted a steeper decline – 23 per cent – in research spending by larger firms.

'Both governments and companies overseas see the need to boost innovation to stay prosperous and to create jobs. If Australia chooses to continue on its backward path, the consequences are crystal clear and should worry all Australians: less competitive companies, fewer quality jobs, higher overseas debts and reduced national security.'

In a joint statement in May, the two spokesmen said they were troubled by the low priority that leaders of Australian companies appeared to place on innovation. They were responding to the results of an international survey by the Arthur D Little company comparing

Australian companies' policies on innovation with those of their counterparts overseas.

The academies, which include many of Australia's leading scientists, engineers and technologists, are committed to supporting the development of a culture of innovation in Australia.

'We will offer our full resources to governments to help achieve this vital goal,' the spokesmen said. 'But governments must hear the message from this survey, and from other evidence previously gathered. Past policy settings are not working and some current policy settings must be questioned. We need to reconsider, and to act quickly, to ensure that this country's prosperity is not undermined by uncompetitive companies with products and services the world market no longer wants.'

## Creating the knowledge economy

The Academy of Science responded to the Federal Budget in May 1998 with proposals for creating a knowledge economy in Australia.

The Academy's Secretary, Science Policy, Professor John White, said that the encouraging fiscal outcome for 1998–99 was a major opportunity for creating a knowledge economy on a sound financial base. The knowledge economy would harness the talents of the science and technology graduates of Australia. It requires:

- vertical integration of investment, stimulation and support programs for industry, and of links between industry and higher education
- a sound higher education system
- the attraction of industrial players and financial organisations to Australia
- support for industry research which uses the potential of Australian science graduates.

Professor White said that there is anecdotal evidence that industrial

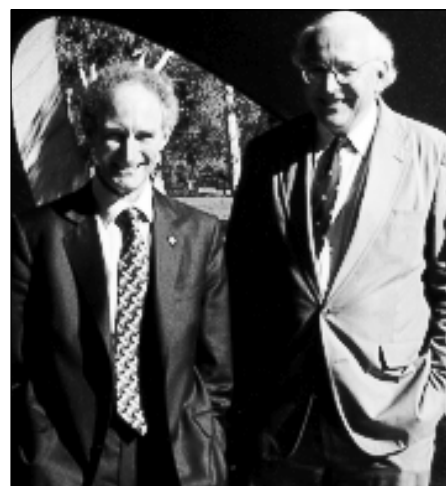
research is faltering following the reduction of the 150 per cent tax concession for research and development to 125 per cent. The Budget papers show that the take up of START funds has been slower than expected.

He welcomed the government's continued support for the Cooperative Research Centres program. 'The drop in funds until 2001 may need to be reassessed in the light of the strength of the new proposals.'

The higher education system appears healthy, with a record number of new undergraduate places and funding of \$5.5 billion for 1998–99. Analysis of this figure reveals the government saving, by comparison with the 1997 and 1998 forward estimates, about \$3 billion in 1998–99 and 1999–2000.

The Academy recommended that priority be given to reinvestment of some of these funds into creating diversity and excellence in the higher education system.

Professor White said that the budget of the Australian Research Council



The Academy's Secretary, Science Policy, Professor John White, right, and the Chief Scientist of the UK, Professor Bob May, at the Biological Informatics conference in July. See story on page 2.

needed to be addressed since the estimates for 1998–99 hardly differed from those of 1997–98 and the council faced new challenges.

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# Biological informatics

In the carefully phrased world of science, few predictions are boldly stated. Yet in July, Professor Bob May, the Chief Scientist of the UK and a Corresponding Member of the Academy, told those attending the conference on biological informatics that 'there will be winners and there will be losers' among nations as the world moves into the next century.

Sir Robert said, 'The next century will be the Age of Biology, just as this one has been an age of physics and astronomy. Specifically, those countries which best learn how to correlate, analyse and communicate biological information will be in the leading position to achieve economic and scientific advances.'

During the conference on biological informatics (a contraction of 'information' and 'automatic'), held from 6 to 8 July at the Academy, 10 visiting and 22 Australian scientists presented their views of the future of biology as it will be affected by the information sciences.

The Academy's Foreign Secretary, Professor Michael Pitman, noted that 'the accumulation of biological data for its own sake has become a useless exercise.' Many of the other speakers at the conference agreed.

Professor Warren Ewens, Director of the program in bioinformatics at the University of Pennsylvania, teaches students about the sorts of software that are available to analyse biological information at the gene and chromosome levels.

Biology has something to learn from astronomy. The Head of the CSIRO Australia Telescope, Dr Ray Norris, pointed out that astronomy benefited greatly when all astronomers, regardless of subdiscipline, adopted a common file format for the exchange of digital information. There is a need for something similar in biology.

The conference was supported by CSIRO, the Commonwealth Department of Industry, Science and Tourism, Environment Australia, the British Council and AMRAD. The Chair of the organising committee was Dr Ebbe Nielsen from the CSIRO Division of Entomology in Canberra.

Dr Nielsen said Australia has been a leader in disseminating environmental information. If these skills are supported and expanded to cover other biological and medical information, Australia can be an informatics winner.

More information on the conference is available from <http://www.science.org.au/bioinfo.htm>.

## Forthcoming events

- A National Science and Industry Forum on genetic engineering in the food chain is being planned for October 1998. Contact Faye Nicholas, email [ac@science.org.au](mailto:ac@science.org.au).
- An Academy conference on environmental variation and change beyond the instrumental record will be held on 7 and 8 December. Phone Professor John Chappell at ANU on (02) 6279 8113.

## Conferences

The Academy's web site has a conference and events database that lists over 200 events occurring in Australia and New Zealand between now and 2001. Events include seminars, exhibitions, science fairs, summer schools, workshops and lectures on the subjects of science, health, information technology, engineering, mathematics and the environment. The database, prepared by the Royal Society of New Zealand, is at <http://www.science.org.au/conf.htm>.

## New topics on Nova

- When bugs have you on the run
- Getting our heads around the brain
- Fuelling the 21st century
- Looking for clues to our mineral wealth.

*Nova: Science in the news* is at <http://www.science.org.au/nova/>

## The Basser Library

Anyone wishing to use the Basser Library should contact the librarian, Rosanne Walker, telephone (02) 6247 3966 or email [rosanne.walker@science.org.au](mailto:rosanne.walker@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 or the Development Officer, telephone (02) 6247 5777.

# Fundamental research is healthiest

The Academy of Science has recommended that governments' role in medical research policy should not be driven by short-term pressures but should recognise that fundamental research is the most effective research path for gaining health care benefits.

The recommendations were contained in the Academy's submission to the Federal Government's review of health and medical research.

The submission stated that calls for a shift to short-term or targeted research should not obscure the fact that most of the major advances in health care in the community come from fundamental, investigator-driven research.

The Academy observed, 'There has been an increasing tendency for governments, as part of a push for short-term medical goals, to create priority areas for research funding, in some cases guided more by community fashion than by expert advice. This can be at the expense of fundamental research which has been the source of most real advances for the community in health care and other areas. There is a danger of seeking magic bullets.'

## Australia's position in medical research

The Academy suggested that a primary goal of the review should be to set policies which maintain Australia's prominence in international medical research. Australia produces 2.5 per cent of the world's medical research publications. Four of Australia's Nobel Prizes were awarded to medical researchers (Macfarlane Burnet, John Eccles, Howard Florey and Peter Doherty).

In the Industry Research and Development Board's *Scoreboard '97* report on business expenditure on research and development a notable feature is that 6 out of the top 10 firms undertaking R&D in Australia are in the biotechnology, pharmaceutical and medical area.

Companies are willing to invest heavily in R&D to be part of rapidly expanding industries. As Johnson & Johnson Research Pty Ltd has stated, 'The most important reason why Johnson & Johnson set up a worldwide R&D centre in Australia is because Australia has excellent medical institutes and research centres.'

The Academy believes that there is

further scope for combining Australia's research strength and industrial capacity towards improving public health and the national economy. In the USA and Canada, medical research budgets will increase rapidly over the next five years.

Meanwhile, there is pronounced insecurity in the Australian university sector. Coordination of higher education research policy and medical research policy is desirable. For the future funding of the National Health and Medical Research Council, the Academy recommends that the review analyse and exemplify the value of medical research, both as a scholarly enterprise and as a significant leader of industry and the economy.

The Academy urged the review to recommend ways to balance funding to

encourage university-based research and postgraduate training and to provide a more diversified funding basis for medical research institutes.

In considering the balance between different styles of basic medical research, the Academy recommended that the review maintain research strength at individual researcher level, while supporting the formation of consortiums between researchers in different departments.

The Academy recommended that, in making decisions about the future allocation of support for medical research, broader community benefits be incorporated into the equation.

The complete submission is on the Academy's web site at <http://www.science.org.au/policy/statemen/health.htm>.

## West report inadequate

The bodies representing Australia's leading scientists and engineers have criticised inadequacies in the West committee report on higher education. The report, *Learning for life*, was released in April.

In a joint response to the West report in June, the Academy of Science and the Academy of Technological Sciences and Engineering supported the recommendation that wide access to higher education be maintained, but found the report inadequate as a guide to implement this. The Academies were particularly critical of funding levels and formulas, marketplace ideology and the lack of weight given to the cultural contribution made by university life.

Funding levels per student in Australia have been substantially reduced. International benchmarking would have revealed that Australia is trying to run a university system on a much cheaper basis than comparable countries.

The current formulas for funding have tended to make the system more uniform. The West committee has failed to consider how many institutions of the highest research and teaching quality can be supported.

While the report supports the need for diversity in the system, it proposes only student choice as the means to address this. In the Academies' view,

this marketplace ideology is too coarse and could be destructive.

The success of the higher education system in attracting fees appears to have outweighed the cultural contribution of university life. The report's prevailing concept of the university as an industry fails to address such matters as the quality of university research and teaching.

The Academies prepared the outline of an alternative model for university funding, based on recent British experience. Key features of the Academies' model are the five-yearly assessments of research performance, block grants to universities for research and research training based on the reviews, additional infrastructure support linked to competitive research grants to individuals and centres, large equipment items funded from a central contestable fund, provision for funding major national facilities and access to overseas facilities, and closer coupling of the funding of research and training.

The main benefit of the model would be to focus resources on areas of research excellence, recognising that some universities may have strong research centres in many disciplines and others may have strengths in perhaps one or two areas.

The submission is on the Academy's web site at <http://www.science.org.au/policy/statemen/west2.htm>.



## More maths for Nova

The Science and Technology Awareness Program of the Commonwealth Department of Industry, Science and Tourism has granted funds to the Academy to develop several new mathematics topics for the *Nova: Science in the news* web site. Information boxes about maths will also be added to existing *Nova* topics. Included in the grant are funds for promoting the web site to mathematics teachers.

There are now about 30 topics available on *Nova*, with a new topic being added every couple of weeks during school terms. Each topic includes key text, a glossary, student activities, further reading and links to relevant web sites.

Four new topics are:

**When bugs have you on the run**  
Consumers are demanding food with fewer chemical preservatives and additives. This means that good hygiene and safe storage conditions will have to play an even more important role in preventing food poisoning. Topic sponsored by the CRC for International Food Manufacture and Packaging Science.

**Getting our heads around the brain**  
Neuroscience has been described as the last great frontier of human biology. In fact, NASA's most recent mission, *NeuroLab*, was devoted to investigations involving the nervous system. Australian neuroscientists are among the leaders in brain research. Topic sponsored by the Howard Florey Institute of Experimental Physiology and Medicine.

**Fuelling the 21st century**  
Fuel cells are an efficient and low-polluting way to generate power. The Australian Technology Park in Sydney is about to install Australia's first commercial fuel cell. Topic sponsored by the Commonwealth Department of Industry, Science and Tourism.

**Looking for clues to our mineral wealth**  
Topic sponsored by the Australian Geodynamics CRC and the Commonwealth Department of Industry, Science and Tourism.

Supported by the Australian Foundation for Science

## Primary experience

More than 36 per cent of primary schools in Australia have purchased all or part of the Academy's science, technology and environment program for primary schools, *Primary Investigations*.

After a few years with *Primary Investigations*, teachers have discovered more of what the program has to offer and how to make the most of it.

A teacher at Collier Primary School in Perth, Tony Goss, reported, 'Children from lower primary grades, less orientated to weekly schedules, ask several times a week, "Are we having science today?" *Primary Investigations* works, is adaptable, both children and teachers enjoy it, and science is once again a vital and viable area of learning

in all of our classrooms.'

The science coordinator at Como Primary School in Perth, Penny Herne, indicated that a 'fantastic team of dedicated parents' has helped prepare equipment for weekly lessons.

More information about *Primary Investigations* is available on the Academy's web site at <http://www.science.org.au/pi>. Sample lessons from seven grades of *Primary Investigations* will be added to the web site soon.

Meanwhile, the Kirby Foundation has provided additional funding for starter grants to support schools with special needs.

Supported by the Australian Foundation for Science



Students from St Vincent de Paul Primary School, Aranda, Canberra, make cellophane windows to explore the effect of combining colours, a lesson from the *Primary Investigations* program.

## Academy TV

Optus Vision's educational channel 55 has been broadcasting a number of Academy productions in recent months. Coming soon are:

### Pests and people

The Academy's May symposium on pests gained widespread coverage in news media. The proceedings of the symposium will be shown on Optus Vision channel 55 in Sydney, Melbourne and Brisbane. Two talks will be shown each week from 4 August to 3 September 1998, first on Tuesdays from 2-3pm, and repeated on Thursdays from 8.30-9.30pm. Short versions of the papers will be published in *Australasian Science* in September.

### Scientists reflect: the environment

In interviews conducted as part of the Academy's project, *Video Histories of*

*Australian Scientists*, scientists working in the environmental area reflect on their early interest in science, the people who influenced them and the highlights of their careers. The interviews will be shown on Tuesdays from 2-3.30pm, and repeated on Thursdays from 8.30-10pm. Sir Otto Frankel will be on 8 and 10 September, Professor Ralph Slatyer on 15 and 17 September, Dr Doug Waterhouse on 22 and 24 September, and Professor Frank Fenner on 29 September and 1 October.

## Foundation AGM

The annual general meeting of the Australian Foundation for Science will be held in Canberra on 24 November 1998.

# Queen's Birthday Honours

Two Fellows of the Academy received honours in the Queen's Birthday Honours List in June 1998.

**Professor Antony Burgess**, Director of the Ludwig Institute for Cancer Research in Melbourne, was made a Companion in the General Division of the Order of Australia (AC). He received the honour for his service to scientific research and clinical medicine, particularly through research into the early diagnosis and treatment of cancer, and for developing structures to link diverse research units to facilitate the exchange of information protocols for the most effective means of treating cancer.

**Emeritus Professor Mollie Holman**, of Monash University, was made an Officer in the General Division of the Order of Australia (AO) for her service to scientific research, particularly relating to the autonomic nervous system and the control of smooth muscle, and to education and university administration.

## Other honours to Fellows

**Professor Kenneth Freeman**, of Mount Stromlo and Siding Spring Observatories at the Australian National University, has been elected a Fellow of the Royal Society of London.

The University of Queensland awarded an honorary doctor of science degree to **Dr Hal Hatch**, from the CSIRO Division of Plant Industry in Canberra.

The Society for General Microbiology and Institute of Biology in the UK have awarded the 1998 Kathleen Barton Wright Memorial Prize to **Professor Bruce Holloway** for his 'outstanding contribution to research in the area of microbial genetics as applied to the genus *Pseudomonas* in particular'. Professor Holloway is at Monash University in Melbourne.

A Corresponding Member of the Academy, **Professor Rolf Zinkernagel** from the University of Zurich, has been elected a Foreign Member of the Royal Society of London.

## Space research list

The Academy's National Committee for Space Science has compiled its biennial report on space-related research in Australia, *Australian Space Research 1996–1998*. The report, which covers the period from July 1996 to June 1998, has been submitted to the International Council of Scientific Unions Committee on Space Research.

The report lists organisations active in space research and briefly describes what they are doing. The organisations include CSIRO, universities, government bodies such as the Australian Antarctic Division and the Ionospheric Prediction Service, and companies such as British Aerospace and DSpace. The research areas encompass remote sensing of the earth, solar terrestrial physics, upper atmospheric physics, climate and weather modelling, space astronomy and space communications.

The Chairman of the National Committee for Space Science and editor of the report, Professor Brian Fraser, stated, 'A look at the contributions indicates the wide range of research activities underway.'

Since the last report, there have been developments in the Australian

National Space Program. Following an interdepartmental review in 1995, to which the Academy contributed, and a change of government, CSIRO was invited to assemble groups interested in an Australian microsatellite program. This has led to the establishment of the Cooperative Research Centre for Satellite Systems. The centre's activities are described in the report.

The 116-page report is available in Adobe Acrobat format from the Academy's web site at <http://www.science.org.au/policy/statemen/contents.htm>.

## Austrian visitors

On 29 April 1998, Academy officers and staff met a delegation from Austria which was visiting Australia to find out about the Cooperative Research Centres program. Austria is currently changing its national structure of science and technology and the visitors were impressed by the Australian initiative to link science and industry more closely. A pilot scheme called the K plus program has started in Austria.

## Andeans, bomb tests and the Big Bang

The Academy's 1998 Selby Fellow was Professor David Dearborn, a research physicist at the Lawrence Livermore National Laboratory in California. He has worked extensively in nucleosynthesis, stellar evolution and astro-particle physics.

While in Australia in May, Professor Dearborn delivered public lectures and professional seminars in Melbourne, Sydney, Canberra, Adelaide, Perth and Hobart. Reflecting his broad range of interests and experience, his topics were ancient Andean astronomy, the responsible stewardship of nuclear stockpiles and the evolution of light elements in the galaxy.

In his lecture on ancient Andean astronomy, Professor Dearborn examined new evidence that has allowed historians and astronomers to better understand the nature of the Incas' solar observations. The evidence has posed as many questions as it has solved, however. How accurate were the observations and what did the Incas learn from them? How was this sky-watching activity integrated into the Inca imperial system? Using a combination of ethnohistorical accounts, archaeological fieldwork and ethnographic research, he pieced together the sky-watching practices of the Incas and showed how these practices contributed to organising their empire.

Professor Dearborn drew upon his experience as a physicist and designer of nuclear devices at the Lawrence Livermore National Laboratory for his other lecture topic, in which he described the anatomy of a nuclear test and discussed what physicists try to learn from weapons design. He argued that genuine weapons design is an innovative activity, nurturing mental agility, and asked how this innovation can be maintained with a comprehensive test ban.

In his seminar on the evolution of light elements in the galaxy, Professor Dearborn examined the apparent overproduction of helium-3 in stellar and galactic chemical evolution models, a finding which is inconsistent with Big Bang nucleosynthesis. This affects calculations of the age and density of the universe.

# New Fellows

Twelve of Australia's leading scientists were honoured by election to Fellowship of the Academy of Science at the annual general meeting of the Academy on 30 April 1998.

Election to the Fellowship recognises a career that has significantly advanced the world's store of scientific knowledge. The new Fellows are:

**1. Professor John Andrews, 56,** Research School of Biological Sciences, Australian National University.

Professor Andrews' research has combined chemistry and enzymology with plant molecular genetics and physiology. He is distinguished for his contributions to our understanding of the action, structure and regulation of rubisco, the world's most abundant protein and enzyme, and the primary catalyst of photosynthesis. He shared in the discovery of the oxygenase function of rubisco and its role in photorespiration. Since then he has worked to see how molecular structure and function affect its efficiency.

**2. Professor Bruce Chappell, 61,** Department of Geology, Australian National University.

Professor Chappell has made outstanding contributions in two areas of geoscience: the origin of granites and the role of these rocks in the evolution of the earth's crust, and the field of trace element analysis by x-ray spectrometry. Early in his career he recognised that many granite magmas do not initially separate as melts from their source rocks deep in the crust but move bodily away from those sources as a mixture of melt and solid residual material. Consequently, when melt and solid material separate, there are compositional variations in the granite. So the composition of the source rocks of many granites may be inferred from a study of that compositional variation.

**3. Professor Graeme Clark, 62,** Professor of Otolaryngology, University of Melbourne.

For the past 30 years Professor Clark has devoted all his efforts to development of a cochlear implant system which gives children who have been profoundly deaf since birth the ability to recognise speech. His early research into the electrical transduction properties of the cochlea established

the need for a multi-channel multi-electrode system based on analysis of speech signals. This system, developed in collaboration with electrical engineers and other specialists, has been implanted into more than 15 000 people worldwide.

**4. Professor David Doddrell, 53,** Professor of Magnetic Resonance, University of Queensland.

Professor Doddrell has found innovative and unique methods for applying nuclear magnetic resonance spectroscopy to structural chemistry, medical imaging and imaged directed spectroscopy. He co-invented the elegant DEPT pulse sequence and developed the SPACE method for obtaining chemical information from living tissue.

The latest generation of high-performance, high-speed commercial magnetic resonance imaging systems all use a method invented by Professor Doddrell. This invention shows how pure research can be applied to medical diagnosis and generate significant financial benefits for Australia.

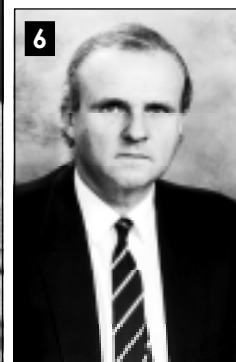
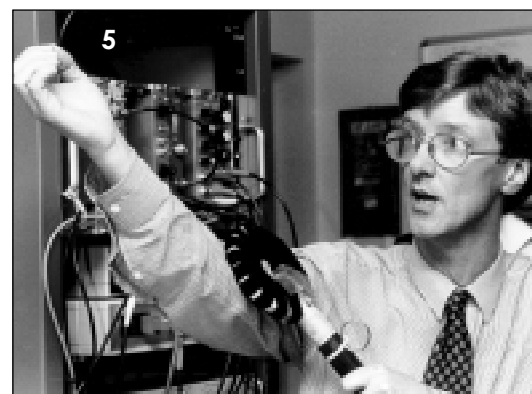
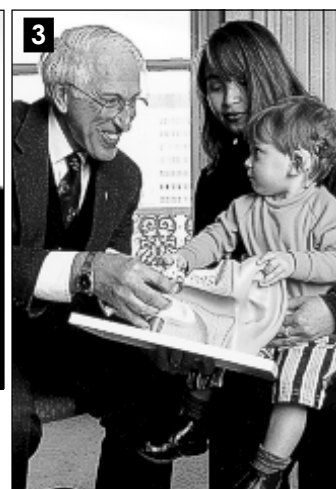
**5. Professor Simon Gandevia, 44,** National Health and Medical Research Council Senior Principal Research Fellow, Prince of Wales Medical Research Institute, Sydney.

A major theory used to be that respiratory muscle failure and fatigue caused people to stop breathing; Professor Gandevia's work on respiratory muscle fatigue has shown that these muscles fatigue only with great difficulty. It is probably the failure of the chemical and neural drives to breathing that cause respiratory failure. Professor Gandevia's work has clearly revolutionised thinking on this important condition.

In one experiment he and some colleagues paralysed themselves while still conscious to investigate respiratory sensations when breathing was modified or stopped.

**6. Emeritus Professor John Kerr, 64,** University of Queensland.

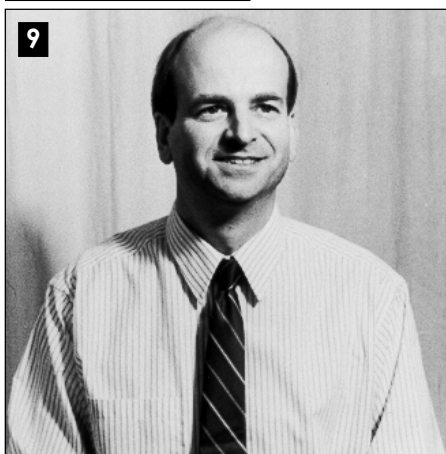
In 1972 Professor Kerr and two colleagues published a landmark paper on physiological cell death. They





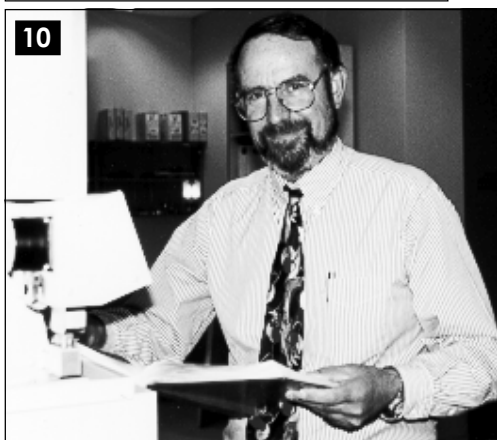


named this process apoptosis, to emphasise that it is complementary but opposite to mitosis. Professor Kerr was the first to work out the structural features of apoptosis, showing it to be quite distinct from necrosis, which is provoked by tissue injury. He drew attention for the first time to the role of cell death in normal adult mammals and in disease.



**7. Professor Gus Lehrer, 51,** Head, School of Mathematics and Statistics, University of Sydney; Head, Centre for Mathematics and its Applications, Australian National University.

Professor Lehrer is a mathematician of unusually wide knowledge and interests. His main field, technically called the complex representation theory of the finite groups of Lie type, has strong links with each of the major areas of algebra, geometry and topology.



**8. Professor Jack Martin, 61,** Professor of Medicine, and Chairman, Department of Medicine, University of Melbourne; Director, St Vincent's Institute of Medical Research.

Professor Martin has greatly advanced contemporary understanding of calcium-regulating hormones and the biology of bone cells. One of his most outstanding contributions was the cloning of parathyroid hormone-related protein. Professor Martin's research has had a major impact on our understanding of bone synthesis and disorders such as osteoporosis.



**9. Professor Jeremy Mould, 48,** Director, Mount Stromlo and Siding Spring Observatories, Australian National University.

Professor Mould is one of the world's leading astronomers. He is distinguished for his studies of galaxies and the universe. He was the first to show that the dwarf spheroidal galaxies, which are companions to the Milky Way, had a star formation history extending over billions of years, in contrast to the view that these galaxies were pure samples of the oldest stars in the universe. He pioneered the observational study of velocity deviations from smooth expansion in the local universe. He leads a very large international project to measure the Hubble constant with the Hubble Space Telescope. The

Hubble constant gives the rate of expansion and age of the universe.

**10. Dr Roger Summons, 51,** Chief Research Scientist, Australian Geological Survey Organisation, Canberra.

Dr Summons is one of the leading organic geochemists in the world. He has applied innovative instrumental techniques to biological marker identification and explained the significance of biological marker data in terms of its relevance to biological evolution, the behaviour of microbial ecosystems and the co-evolution of the biogeochemical cycles and the surface environment of the earth. His work has revealed substantial clues about the proterozoic oceans and he has made numerous contributions to fundamental work on changes over time in the distribution of chemical fossils.

**11. Professor Rodney Tucker, 50,** Professor of Electrical Engineering and Director, Photonics Research Laboratory, University of Melbourne.

Professor Tucker was a recipient of the 1997 Australia Prize. He has made fundamental contributions in the field of telecommunications over a period of 25 years. He has played a leading role in telecommunications research, both in Australia and internationally.

He pioneered a revolutionary microwave circuit approach to the analysis and design of semiconductor lasers for high-speed optical fibre telecommunications. This work overcame a critical bottleneck in the capacity of telecommunications systems and led to a new generation of broadband networks.

**12. Professor Jim Williams, 62,** Professor of Physics, University of Western Australia.

Professor Williams is one of the pioneers of modern atomic physics. He has made very significant experimental studies of atomic structure and scattering phenomena at the most fundamental levels. His experiments have led to new techniques in atomic physics and to an increased understanding of the mechanisms of various collision processes, indicating the ways in which electron correlations determine atomic structure and scattering dynamics.

# New members of Academy Council

Six new members were elected to the Academy's governing council at the annual general meeting in April. Information on the new President, Professor Brian Anderson, was published in the last newsletter. Other new members are:

**Dr Dick Manchester**, Chief Research Scientist at the CSIRO Australia Telescope National Facility in Sydney.

Dr Manchester is an astronomer at the Australia Telescope, which operates radio telescopes at Parkes, Coonabarabran and Narrabri in New South Wales. His main research interests are pulsars and supernova remnants, both products of the finale of the evolution of massive stars – a supernova explosion. Mainly using the Parkes telescope, his group has found more than half of the known pulsars and been active in follow-up studies such as precision timing measurements. With the antenna array at Narrabri, he is witnessing the birth of a supernova remnant – from the supernova SN 1987A – the first time that such observations have been possible. He is also involved in the upgrade of the Narrabri array for operation at millimetre wavelengths, a major national research facilities project.

**Professor Don Melrose**, Professor of Physics (Theoretical) and Director of the Special Research Centre for Theoretical Astrophysics at the University of Sydney.

Professor Melrose's main research interests are in plasma astrophysics. These include the emission mechanisms for sources of radio waves, specifically, the solar corona, the earth and the giant planets, and pulsars; the propagation of radio waves through ionised gases; the acceleration of fast particles in these astrophysical sources; and the scattering of these particles by plasma waves. He also has research interests in non-linear plasma theory, and in the synthesis of quantum electrodynamics and the kinetic theory of plasmas.

**Professor Jack Pettigrew**, Professor of Physiology and Director of the Vision, Touch and Hearing Research Centre at the University of Queensland.

Professor Pettigrew is currently investigating the phenomenon of switching between the hemispheres in the brains of animals and humans. Driven by a brain-stem oscillator, attention alternates back and forth between the different viewpoints and cognitive styles of the two hemispheres. He monitors the process of switching using binocular rivalry in humans and a variety of recording techniques in animals. The interhemispheric switch rate is found to be slower in humans with bipolar disorder; this provides a new insight into the neurobiology of mood disorder.

**Professor John Shine**, Executive Director of the Garvan Institute of Medical Research at St Vincent's Hospital in Sydney, and Professor of Medicine and Molecular Biology at the University of New South Wales.

Professor Shine's current research interests are focused on the application of gene cloning approaches to understanding the molecular basis for the generation of functional diversity in the nervous system. How do a few simple chemical signals, the neurotransmitters and neuropeptides, elicit such a wide range of responses including behaviour, memory, muscle coordination and hormone release? What goes wrong in disorders such as Alzheimer's disease and mental illness?

**Professor John Young**, Professor of Physiology at the University of Sydney since 1976 and currently Pro-Vice-Chancellor (Health Sciences).

Professor Young is a cell physiologist especially interested in the control of electrolyte transport across the secretory and absorptive epithelial cells of mammalian salivary glands. He is particularly interested in epithelial sodium and chloride channels and the means whereby they are regulated by changes in the intracellular concentrations of these ions. His current research (in collaboration with DI Cook) focuses on the identification of an intracellular sodium receptor and the cascade of enzyme interactions that leads from activation of the receptor via a Gi protein to the down regulation of an epithelial sodium channel called ENaC.



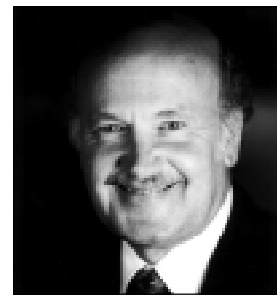
*Dr Dick Manchester, a member in the physical sciences.*



*Professor Don Melrose, a member in the physical sciences.*



*Professor Jack Pettigrew, a member in the biological sciences.*



*Professor John Shine, a member in the biological sciences.*



*Professor John Young, Secretary (Biological Sciences).*



# Major changes for ICSU

The 34th meeting of the General Assembly of the International Council of Scientific Unions (ICSU; Washington DC, September 1996) received a report from an independent assessment of ICSU, chaired by Dr Roland Schmitt. That report explicitly called for significant changes in both the future directions and governance of ICSU. In summary, the review called on ICSU to become:

- an incubator of 'entrepreneurial' activities and 'science for policy'
- the umbrella for concerns of 'policy for science'
- aggressive in its outreach
- efficient in its governance.

In response to these challenges, and since that meeting, the Executive Committee of ICSU has been preparing major revisions to the statutes and rules of procedure in full consultation with ICSU members, both national members and unions. An extraordinary session of the General Assembly of ICSU was held in Vienna at the Austrian Academy of Sciences on 25 April 1998 to examine, modify and approve these revisions.

The General Assembly was preceded by a meeting of the General Committee (to provide further input to the drafting of revisions) on 23 and 24 April. I attended as Australia's representative. I was given proxy power to participate and vote for the Academy at the extraordinary meeting of the General Assembly. The following notes present some of the key changes that have been made as a result of these meetings.

## A change of name

Given that ICSU represents members from both scientific unions and national academies, the word 'union' has been removed from the new name. The acronym has been retained, given its global visibility in the scientific community, and for legal reasons. The new name is *ICSU: The International Council for Science*.

## Widening the objectives of ICSU

Two new objectives were added to the existing objectives. These were 'to encourage the strengthening of human and physical scientific resources world-wide with particular emphasis on the developing world' and 'to promote the public understanding of science'.

## Abolition of the General Committee of ICSU

Probably the most significant single change to ICSU was the abolition of the General Committee. This was regarded by the assessment as having been duplicative and expensive.

## Strengthening of the Executive Committee

The Executive Committee has been strengthened by adding members and by explicitly allocating responsibilities to the officers of the committee. The new Executive Committee is now composed of the officers: President, Past President/President Elect, two Vice Presidents, Secretary General and Treasurer; and ordinary members: four from national committees and four from unions.

## Establishment of working committees

To help the Executive Committee perform its duties, particularly recognising that the General Committee no longer exists, the following working committees were established:

- the Policy Committee – responsible for finance and science planning and reviews, governance, fundraising, responsibility and ethics in science
- special committees such as those responsible for the dissemination of information, science and technology in developing countries, and the environment
- ad hoc committees such as the General Assembly Resolutions Committee.

## Closing personal comments

It is worth noting that the process of making these rather major changes to the statutes of ICSU was potentially divisive and, given the requirement for a two-thirds majority, difficult to achieve. However, it was possible to come to widely accepted revisions in two days because of the very significant opportunities given to members to take part in the drafting of the changes over the past year or so, the open line-by-line debate that was allowed during both the General Committee and General Assembly meetings of the entire statutes and rules of procedures document, and the outstanding chairing of these

discussions by Professor JCI Dooge.

Perhaps my only concern lay with the issue of the widened objectives of ICSU, in particular, with respect to public education. It seems to me that there are many issues with which ICSU could become involved. There are those issues such as freedom in the conduct of science, responsibilities and ethics in science, data availability and so on, that are sufficiently universal to science and international by nature that they are very appropriately taken up by an international organisation such as ICSU.

There are other aspects, such as the application of science in policy formulation (science for policy), where the role is less clear. The science component of policy decisions made at international level, such as agreements on trade and environmental issues, might be considered as a reasonable domain for ICSU but recognising that a very large amount of policy, even for such issues, is made by governments and companies at the national, regional or local level.

More contentious are the appropriate bodies to play a role in consideration of science in public education. Given the highly local to regional nature of educational demands, needs and institutions, it is, for me at least, much more difficult to see how ICSU can play much of a role in this regard. This is not to say that public education in science is unimportant but to make the point that it is important for any organisation to clearly define its niche and roles with respect to all of the players. I look forward to a clear statement from ICSU as to what aspects of public education it might see as part of its role.

## Graeme Pearman

*Chief, CSIRO Division of Atmospheric Research*

## French philosopher

A philosopher from the French Academy, Michel Serres, delivered a public lecture at the Academy on 5 August 1998. The lecture, which was in French, included discussion of the ethics of science. The lecture is part of a program of cooperation between the Australian Academy and the French Academy of Sciences.

# Scientific exchanges

## Germany

Eleven Australian scientists will visit Germany in 1998 under the exchange program between the Australian Academy of Science and the Deutsche Forschungsgemeinschaft.

**Dr Peter Cranston**, of the CSIRO Division of Entomology, will visit the Zoologische Staatssammlung in Munich to study the evolution and biogeography of Australian gondwanan midges.

**Dr Miklos Gulacsi**, of the Australian National University, visited the University of Bayreuth to study polaron formation in Kondo lattice models.

**Dr Richard Hannink**, of CSIRO Manufacturing Science and Technology, visited the Technical University Hamburg-Harburg to examine the feasibility of using Australian mineral resources in the manufacture of refractory lightweight, wear-resistant ceramic-metal-aluminide composites for use in transport and mining.

**Dr Joseph Holtum**, of James Cook University of North Queensland, studied transporters in chloroplast membranes of crassulacean acid metabolism plants at the University of Osnabrück.

**Dr Yuri Kivshar**, of the Australian National University, visited the Max-Planck-Institut für Metallforschung at Stuttgart to study non-linear modes and solitons due to parametric wave mixing.

**Dr Trevor Lithgow**, of La Trobe University, will study the assembly of tail-anchored proteins in biological membranes at the University of Freiburg.

**Dr Igor Shparlinski**, of Macquarie University, will visit the Department of Computer Science at the University of Bonn to study number theoretic methods in design and analysis of algorithms.

**Dr Mark Smyth**, of the Austin Research Institute in Victoria, visited the Institute for Genetics at the University of Cologne to study the creation of mouse models of natural killer cell biology.

**Dr Andrew Stuchbery**, of the Australian National University, will examine microscopic magnetic phenomena studied by recoil implantation at the Hahn-Meitner Institut in Berlin.

**Dr Edward Szczerbicki**, of the University of Newcastle, visited the

Rheinisch-Westfälische Technische Hochschule in Aachen to study the modelling of information flow to enhance performance.

**Dr Sergei Vladimirov**, of the University of Sydney, visited the Max Planck Institute for Extraterrestrial Physics in Garching to study the collective process in dusty plasmas.

## Japan

Six Australian scientists will visit Japan in 1998 and 1999 under the Japan Society for the Promotion of Science Exchange Program.

**Dr Geoffrey Baker**, of CSIRO Entomology in South Australia, studied the control of introduced golden apple snails in rice ecosystems at the Faculty of Agriculture at Shizuoka University.

**Professor Roger Hosking**, of James Cook University, will visit the School of Engineering at the University of Hokkaido to examine the dynamic responses of continuously supported beams and plates.

**Associate Professor Mohan Singh**, of the University of Melbourne, will examine the molecular analysis of pollen allergens at the Laboratory of Plant Breeding in the Faculty of Agriculture at Tohoku University.

**Associate Professor Michael Slaytor**, of the University of Sydney, will visit the Centre for Ecological Research at Kyoto University to study cellulose digestion and symbiotic associations in termites and cockroaches.

**Dr Jiyuan Tu**, from the Australian Nuclear Science and Technology Organisation in New South Wales, will visit the Institute of Space and Astronautical Science in Kanagawa to study high-performance computing on complex multiphase flows.

**Dr Gordon Wilkinson**, of the University of South Australia, will study the modelling of supercritical fluid extraction processes at the Department of Applied Chemistry and Biochemistry at Kumamoto University.

Six Australian scientists will visit Japan in 1998 and 1999 under the exchange with the Science and Technology Agency of Japan.

**Dr Igor Agranovski**, of Griffith University, visited the National Institute of Industrial Health at

Kawasaki to study the filtration of aerosol by bubbling through porous media.

**Dr Ling Li**, of Deakin University, investigated the beach dewatering technique through the comparison of model predictions and field data at the Port and Harbour Research Institute at Yokosuka.

**Dr Yi-Bing Cheng**, of Monash University, will visit the National Industrial Research Institute of Nagoya to study the development of self-toughened alpha-SiAlON ceramics.

**Dr Matthew Glanville**, of Sydney, will study the utilisation of wind tunnel data in the prediction of building-cladding design wind loads at the Building Research Institute at Ibaraki.

**Dr Allan Lohe**, of the Australian National University, investigated genetically engineering the honeybee for agriculture at the National Institute of Animal Industry in Ibaraki.

**Dr Dan Nicolau**, of the RT Technology Development Group in Perth, will visit the Osaka National Research Institute to study the high resolution patterning of arrays of bioactive molecules and cells.

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## Closing dates 1998

Selby Fellowship	30 August
Gottschalk Medal	30 September
Pawsey Medal	30 September
Lyle Medal	30 September
Hannan Medal (applied and computational mathematics)	30 October
Le Fèvre Prize	13 November
Ian Wark Medal and Lecture	13 November

For further information email Faye Nicholas at the Academy on [ac@science.org.au](mailto:ac@science.org.au).

China exchange	1 October
Germany program	1 October

For further information email Thérèse Lewis on [io@science.org.au](mailto:io@science.org.au).

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## Korean polymers

A joint Australia-Korea workshop on polymer melt was held in Seoul from 5 to 10 July 1998. This was a sequel to the highly successful workshop held in 1996 (see *AAS Newsletter* number 35). The Australian coordinator of the workshop was Professor David Boger from the University of Melbourne.

# Death – Bill Priestley



Bill Priestley

One of the pioneers of modern meteorology, Dr Bill Priestley, died on 18 May 1998.

Charles Henry Brian Priestley was born at Highgate, England, on 8 July 1915. At the age of four he could perform quite complicated calculations, including naming the day of the week for any date in the 19th or 20th century. He went to Beaumont House Preparatory School for six years, but following operations and pneumonia was taught at home by HJ Flowers, a Baptist minister with scientific leanings.

While his childhood was comfortable, his father lost money in the Great Depression and died in 1933, leaving the family straitened. Bill won a scholarship to Mill Hill School and attended as a boarder from 1929 to 1934.

In 1934 he gained two scholarships to Cambridge University, where he gained first class honours in mathematics in 1936 and second class honours in economics in 1938. He won a prize for an essay on tides and represented St John's College at cricket and hockey.

He joined the British Air Ministry Meteorological Office in 1939, where Sir Graham Sutton was one of his most important formative influences. In 1941 he went to Canada, where he carried out research into atmospheric turbulence and its application to problems in diffusion and evaporation.

In 1943 he returned to England to work in the newly formed Upper Air Analysis and Forecast Section, which was trying to make upper atmosphere forecasts with a limited network of soundings. Such forecasts affected tactics for the use of fighters and bombers in the second world war. Priestley carried out pioneering work developing techniques for upper

atmosphere analysis, particularly contour analysis. In 1945 he became head of the section.

In 1946 he moved to Melbourne as officer in charge of a new meteorological physics section of Australia's Council for Scientific and Industrial Research (later the CSIRO). This became the Division of Meteorological Physics and later Atmospheric Physics, of which he was Chief until 1971 when he became Chairman of the CSIRO Environmental Physics Research Laboratories.

In 1947 Priestley turned his attention to the quantitative assessment of exchanges of momentum, heat and water vapour between latitudes. He foresaw the expansion of this approach and its contribution to general circulation models of the atmosphere, which are now vital tools in weather forecasting and the prediction of climate change.

His group undertook pioneering studies into vertical transfer processes at the interface of air and earth.

In the 1950s he wrote several important papers on the dynamics of convection, and on air-sea interactions, and the monograph, *Turbulent transport in the lower atmosphere*, which became a leading international text. He was among the first to demonstrate the association between monthly anomalies in sea-surface temperature and changes in rainfall on adjacent coasts and hinterlands.

He applied micrometeorology to problems in agriculture, with research groups working on energy balance in plants and animals, frost prevention and microclimatic studies of plant physiology.

Priestley was elected a Fellow of the Academy of Science in 1954, its first year. He was Vice-President of the Academy in 1959–60. He was elected a Fellow of the Royal Society of London in 1967. He was appointed an Officer of the Order of Australia in 1976.

He was active in international meteorological and scientific bodies and served on 23 committees of the Academy. In the 1970s he chaired Academy committees of enquiry into the atmospheric effects of supersonic aircraft, climate change and French atomic tests.

Priestley retired from CSIRO in 1978 and then spent two years as Professor of Meteorology at Monash University.

## Japanese links

The Academy's International Programs Officer, Thérèse Lewis, visited the Academy's counterpart agencies in Japan, the Science and Technology Agency (which deals with national laboratories) and the Japan Society for the Promotion of Science (which represents universities), in June 1998. She attended the Japan Society for the Promotion of Science two-day orientation program for postdoctoral fellows.

Ms Lewis also attended a meeting of the representatives of international organisations dealing with the Science and Technology Agency. The meeting discussed science policy in Japan and proposed changes to programs.

Both organisations want more Australian scientists to visit Japan for periods of up to two years. Quotas for fellowship programs will be increased as a result. Japanese funding agencies perceive the value to Japan of building international contacts and introducing new people into their system.

Meanwhile, the Australian programs officer of the Japan Society for the Promotion of Science, Mayuko Tada, is working at the Academy for nine months. While in Canberra she is learning about Australian science programs, organisations and scientists.



Mayuko Tada at the Academy.

## Biographers

Professor Harry Poulos, Professor Roger Tanner and Professor John Carter will write a biographical memoir on the late **John Booker** for publication in *Historical records of Australian science*. Dr Barbara Briggs will write a biographical memoir on the late **Lawrie Johnson**. Professor Pauline Ladiges and Dr Donald Gaff will write a biographical memoir on **Bruce Knox**. Dr Jim Peacock, Sir Rutherford Robertson and Dr Roger Carolin will write a biographical memoir on the late **Spencer Smith-White**.



# Lively Boden conferences

## The epididymis

The epididymis is the organ which stores and matures sperm. Its biological role is to enhance a male's prospects of fathering offspring. This role depends on sperm storage. However, interest is now focused on the maturing of sperm in the epididymis.

The Boden Conference on the Epididymis: Cellular and Molecular Aspects was held from 24 to 28 February 1998 at Robertson, NSW. There were 63 participants from 15 countries. The conference addressed the epithelial functions regulating the epididymis, gene expression of epididymal proteins and their roles in protecting sperm and modifying their surface, and practical aspects including targeting the epididymis for contraception, its susceptibility to environmental toxicants and its role in infertility.

Australian scientists showed that oestrogens can play an important role

in the functions of the epididymis: oestrogen therapy inhibits the reabsorptive function of the ducts that reabsorb 95 per cent of the fluid leaving the testis. The epididymis was also considered as a target for immunocontraception and a species-specific epididymal protein as a control on populations of feral animals.

The conference was considered a great success and several overseas scientists stayed on to collaborate with their Australian colleagues. Others made plans to return within a year for collaborative work and graduate students made valuable contacts for postdoctoral positions overseas. A series of international conferences on the epididymis will be established, with another meeting in the USA in 2002.

The main contributions at the conference will be published as a supplement of the *Journal of Reproduction and Fertility* in August 1998.

## Synaptic transmission

The synapse is the place where impulses are transmitted from one nerve to another using electrical and chemical means.

The Boden Conference on Synaptic Transmission, held at Lake Crackenback Resort near Thredbo in NSW from 24 to 27 January 1998, looked at the microphysiology of synaptic transmission. The conference was attended by 48 scientists, 19 from overseas. Younger scientists (aged under 40) made up the majority of the participants.

The presentations focused on the molecular mechanisms of exocytosis (the expulsion of material from the inside to the outside of a cell); the control of transmitter release by calcium and neuromodulators; quantal mechanisms, transmitter uptake and second messengers in neurotransmission; the plasticity of synaptic transmission; and the spread of synaptic potentials and action potentials in neurones.

The organiser of the conference, Professor Stephen Redman from the John Curtin School of Medical Research at the Australian National University, said that the mix of young and more established scientists, together with the strong overseas contingent, made the conference lively and exciting. 'The younger scientists soon overcame any timidity they may have had to ask provocative questions.'

Several collaborative activities have already come from the conference and the contacts and exchanges of scientific information will have enduring value.

## Biodiversity talk

Not counting bacteria and viruses, about 5 to 7 million kinds of plants, animals, fungi and microorganisms occur on the earth. By some estimates, by the first quarter of the next century, more than a quarter of all species will be extinct or on the way to extinction.

Dr Peter Raven, Director of the Missouri Botanical Garden, presented a lecture entitled *Biodiversity in the new millennium: what should we do?* at the Academy in Canberra on 28 July 1998. He spoke of the need to organise collective responses appropriate to the scale of this challenge or suffer the consequences.

Dr Raven is a Corresponding Member of the Academy.



Hot-air-filled wildlife inspects heritage site in Canberra. Photo: Trish Nicholls

## Heritage listing for dome

The Academy's Becker House, a landmark known to most Canberra visitors as the Dome, has been added to both the national and ACT heritage lists. It was listed on the Register of the National Estate in February 1998 and on the Interim ACT Heritage Register in May.

Ian Potter House, which houses the Academy's administration, has been on the Register of the National Estate since 1981.

The Academy has also received an ACT heritage grant to prepare nominations for the ACT Heritage Objects Register. The nominations are for the architectural documents submitted in the 1956 competition to design the Academy building, drawings and blueprints related to the winning design by Sir Roy Grounds, and the flag flown over the South Magnetic Pole on Shackleton's 1908-9 Antarctic expedition.