



The new order for research in higher education needs new funding

The President of the Academy, Professor Brian Anderson, has welcomed the Federal Government's Higher Education Research and Research Training Green Paper. Professor Anderson described the discussion paper as a 'determined effort' to address the needs of the higher education research system; the Academy has given its support to the aims of promoting diversity and excellence in higher education research.

The Academy has, however, also recommended a number of changes to the proposals in the Green Paper.

The Academy has warned that there must be greater concern about possible negative consequences which could reduce Australia's research performance.

Professor Anderson said he was particularly pleased with the administrative changes to the Australian Research Council and its enhanced role, but warned that changes would only be beneficial if accompanied by increased funding for university research. He cautioned that over the past decade 'the needs of our vital higher education research system have been left behind'.

The Academy supports a system of peer review for research proposals and acceptance of applications more than once a year. The Academy believes it is essential that the Australian Research Council develop priorities for allocating funding between the various disciplines.

Differential stipends should be used to encourage research in areas of defined national need. The Academy has also recommended that young researchers not be excluded de facto from Large Grants.

Professor Anderson warned that Australia's research performance would 'continue to slip' if the squeeze on funds for university infrastructure continued. The Academy has given strong support

to the inclusion of a research overhead component in competitive research grants and recommends an infrastructure component of 50 per cent of research grants. This would require about \$120 million per year in new funds.

The Academy is concerned that some proposals in the discussion paper may fail to support excellence and promote diversity. It recommends a research assessment exercise be established to determine the research performance and prospects of universities at the departmental, or research unit, level, so deriving a quality factor for funding. Professor Anderson said, 'Competition for research funding without quality control will waste our precious funds.' He warned against using simple formulas based on student numbers and external funding to allocate institutional grants.

The Academy also recommends that the value of research student positions at universities be weighted in favour of disciplines in which research is inherently more costly.

The Academy believes holders of postgraduate awards should be freer to change institutions to find the most appropriate research supervisor and that researchers who change institutions should be provided with a 10 per cent loading to their stipend and allowed three years after the move to complete their work. The Academy prefers the current six-month delay period over the proposed one-year delay to switching institutions.

The outcomes of the research assessment exercise should be available to potential students so they can better choose their institution. Otherwise, students will not be coupled with the most appropriate supervisors.

Professor Anderson said, 'Now is the time to get our research organisation and funding structures right, and to proceed with a national plan of investment in this crucial component of a knowledge economy.'

The full text of the Academy's response to the Green Paper is available at www.science.org.au/policy/statemen/green.htm.

Innovation summit

The Federal Government and the Business Council of Australia are sponsoring a National Innovation Summit to be held in Melbourne on 10 and 11 February 2000. The summit aims to identify strategies for governments, industry and the research community to improve Australia's innovation capacities and international competitiveness.

The President of the Academy, Professor Brian Anderson, has been

taking an active role in the summit, both as a public advocate of policies supporting innovation and as a member of the summit steering committee, which is overseeing the planning of the event.

More information on the summit is available from the Department of Industry, Science and Resources web site at www.isr.gov.au/industry/summit/index.html.

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Higher education funding needs more thought

The Academy has recommended that policy options for higher education funding be subject to a green paper process like that used for higher education research. After consultation on the options in a green paper, a white paper should be produced as a contribution to the National Innovation Summit in February 2000.

The President of the Academy, Professor Brian Anderson, said, 'Higher education is too important for our economic future to be subjected to substantial policy changes without consultation.'

In its submission to the West Committee review of higher education funding, the Academy advised that the current balance of public and private contributions to the costs of undergraduate education (about 2:1) should be maintained. Government contributions should not be reduced further.

The submission observed that a full voucher system would lead to a mismatch of student demand and existing infrastructure.

The Academy is also concerned that the differential Higher Education Contribution Scheme charges that result in higher costs to science students discourage students from entering science courses and careers. 'We are particularly concerned about the supply of qualified teachers for our schools,' Professor Anderson said.

Endangered animals research

The Academy has used private funding to establish a program to support research into the conservation of endangered native animals and has made its first three awards. Dr Patricia Woolley will receive \$13 300 to study the Julia Creek dunnart; Dr David Taggart will receive \$12 000 to study the south-eastern Australian brush-tailed rock wallaby; and Dr Jean-Marc Hero will receive \$10 000 to investigate endangered frogs in south-eastern Queensland.

Conferences

The Academy's web site has a conference and events database that lists events occurring in Australia and New Zealand between now and 2003. 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 www.science.org.au/conf.htm.

New topics on Nova

- Alcohol and cars – a volatile mix
- Stock markets – putting your money where your math is
- Good prospects ahead for data mining
- Conservation genetics – molecular detectives at work

- Generating new ideas for meeting future energy needs
- Biomass – the growing energy resource
- Can we count on your vote?
- Sodicity – a dirty word in Australia

Nova: Science in the news is at 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.

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.

The importance of physics

In March the International Union of Pure and Applied Physics adopted a statement on the importance of physics to society, with the aim of increasing the wider community's appreciation of this basic science. The statement is reproduced below.

Physics – the study of matter, energy and their interactions – is an international enterprise which plays a key role in the future progress of humankind. The support of physics education and research in all countries is important because:

1. Physics is an exciting intellectual adventure that inspires young people and expands the frontiers of our knowledge about nature.
2. Physics generates fundamental knowledge needed for the future technological advances that will continue to drive the economic engines of the world.
3. Physics contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries.
4. Physics is an important element in the education of chemists, engineers and computer scientists, as well as practitioners of the other physical and biomedical sciences.
5. Physics extends and enhances our understanding of other disciplines, such as the earth, agricultural, chemical, biological, and environmental sciences, plus astrophysics and cosmology – subjects of substantial importance to

all peoples of the world.

6. Physics improves our quality of life by providing the basic understanding necessary for developing new instrumentation and techniques for medical applications, such as computer tomography, magnetic resonance imaging, positron emission tomography, ultrasonic imaging, and laser surgery.

In summary, for all these reasons, physics is an essential part of the education system and of an advanced society. We therefore urge all governments to seek advice from physicists and other scientists on matters of science policy, and to be supportive of the science of physics. This support can take many forms such as:

- national programs to improve physics teaching at all levels of the educational system
- building and maintaining strong departments in universities (and other academic institutions) with opportunities for grants to support research
- scholarships and fellowships for both undergraduate and graduate students studying physics
- adequate funding for national laboratories and the formation of new ones as appropriate
- funding and facilitating international activities and collaborations.

Intellectual ownership report on the web

Will copyright survive the World Wide Web?

Can indigenous communities control their heritage?

Should the building blocks of life be patentable?

The National Academies Forum (soon to be renamed the Council of the Australian Academies) and the National Library of Australia hosted a symposium on scholarship, intellectual ownership and the law on 15 and 16 July 1999, bringing together speakers with diverse views on the topic.

The symposium covered proposed and existing legislation relevant to creators and consumers of intellectual property; access to information, including ownership of publicly generated data in databases (which could be affected by a proposal of the World Intellectual Property Organisation); online publishing, copyright and fair dealing provisions; ownership and the biota, including human genetic information and bioprospecting; and licensing issues and wealth creation.

IP Australia and the Commonwealth Department of Communications, Information Technology and the Arts were the major sponsors.

Summaries of the papers presented and discussions that took place at the symposium were published in a 16-page booklet, which proved so popular that no copies are left. However, the booklet is available in Acrobat format from the National Academies Forum web site at www.naf.org.au/iosymp.htm. The site also includes HTML summaries and some complete papers.



Swedish visitor

The Secretary General of the Royal Swedish Academy of Sciences, Professor Erling Norrby, left, visited the Academy in August. He is pictured with Professor Brian Anderson.

Foundation projects approved

At its meeting in September, the Board of the Australian Foundation for Science agreed to underwrite five new projects. The projects deal with the Academy's Becker House (the Dome), science education and scientists' life stories.

The Academy will mount an exhibition on the design and construction of the Dome, in conjunction with its refurbishment for the Centenary of Federation in 2001. The exhibition will include the 1956 design commissions; drawings and blueprints of the building by the architects, Grounds, Romberg and Boyd; drawings for the furniture, designed by Fred Ward; old photographs and film; a video interview with the Academy's first Executive Secretary, Jack Deeble, about the design and construction of the Dome; and souvenirs featuring the building.

The aim of the project is to increase public understanding of the innovative

design and construction of the Dome and its role as a symbol of Canberra. A tour of the Dome during Heritage Week in 1999 proved very popular.

A second project is to create a science education home page on the Academy's web site. This would streamline access to the Academy's science education information for busy teachers. The page would be attractively designed and include brief announcements of new resources on the web site and links to *Nova: Science in the News*, video interviews and biographical memoirs, and *Primary Investigations*. Teachers would be able to register for email notification of new materials.

The new home page would be promoted through science teachers' journals.

The Academy has recorded 25 video interviews with scientists for its *Video Histories of Australian Scientists*. A third project is to develop teachers notes, to be made available with the edited

transcripts of the interviews on the Academy's web site. The notes would make it easier for teachers to use excerpts from the interviews in science classes. A fourth project is to complete the transcription and editing of the video interviews.

The Academy has produced booklets for several states that outline sample teaching programs for the *Primary Investigations* science, technology and environment program for primary schools. New South Wales and Victoria are revising their educational learning outcomes and new booklets will be required. In this project the sample programs will be rewritten, printed and sent to all schools in the relevant state, with other marketing material for *Primary Investigations*. The sample programs would also be added to the web site.

Supported by the Australian Foundation for Science

The knowledge economy

An article by the President of the Academy, Professor Brian Anderson, exploring Australia's need to address shortcomings in education, research and industry in order to be able to compete effectively in the international knowledge economy, appeared in the newsletter of the Business/Higher Education Round Table.

Professor Anderson warned that Australia was 'moving backwards' in terms of the supply of information technology and trained researchers and that this problem had been made worse by the Federal Government's cuts to funding for universities and reduced incentives for industry to undertake research and development. Professor Anderson called for a change of public policy and private attitudes.

The full text of the article is available from the Academy's web site at www.science.org.au/policy/statemen/bhert.htm.

Pitman resigns as Foreign Secretary

Professor Michael Pitman has resigned from his position as the Academy's Foreign Secretary because of ill health. The Council has expressed its gratitude for the contribution Professor Pitman made during his term of office. He has been Foreign Secretary since 1997. Professor Pitman, a plant physiologist, is a former Chief Scientist of Australia.

As a result of Professor Pitman's resignation, Professor Kurt Lambeck, currently Secretary (Physical Sciences), will become Foreign Secretary. Professor Bruce McKellar will fill the casual vacancy created by Professor Lambeck's resignation.

Biographers

Biographers have been appointed to write biographical memoirs of former Fellows in Historical Records of Australian Science. Dr Wesley Whitten, Associate-Professor Grant Stone and Emeritus Professor Ray Wales will write about **Clifford W Emmens**; Professor Angus Hurst will write about **HS (Bert) Green**.

More video histories transcribed

The video histories of Professor Bernhard Neumann, Professor David Craig, Professor Priscilla Kincaid-Smith, Sir Geoffrey Badger, Dr Doug Waterhouse and Professor Peter Bishop have recently been transcribed and edited. They are available, along with interviews with Professor Peter Doherty and Sir Rutherford Robertson, at www.science.org.au/educatio/educatio.htm.

As mentioned in an earlier newsletter, the Academy is undertaking 20 video interviews funded by a Centenary of Federation history and education grant. This series, called *100 Years of Australian Science*, will feature equal numbers of men and women. The first interview has been done with Professor Neville Fletcher.

Supported by the Fenner Fund and the Australian Foundation for Science

Helping migrants help their children learn science



The Academy and the Canberra Institute of Technology have conducted a series of free English language sessions to help migrants improve their conversation skills. The sessions involve groups of migrants undertaking scientific investigations drawn from the Academy's *Primary Investigations* science, technology and environment program for primary schools.

The sessions are designed for parents and grandparents to give them skills to help their children and grandchildren with their school work.

The course was funded by the ACT Department of Education and Community Services through its Adult and Community Education program. The Academy's Development Officer, Dr Nancy Lane, said the activities develop skills in communications and vocabulary. She said, 'From training teachers to teach the *Primary Investigations* program, we know that adults enjoy these science activities as much as the children.'

Supported by the Australian Foundation for Science

Julia Garro carries out a Primary Investigations activity during the English through science program at the Canberra Institute of Technology.

AGM 2000 symposium looks to the future

Plans are underway for next year's annual general meeting symposium. Dr Dick Manchester, from the CSIRO Australia Telescope, and Professor John Shine, from the Garvan Institute of Medical Research in Sydney, are organising a program on Australia's science future. This will look at the frontiers of a range of disciplines and will feature a number of the country's brightest young researchers.

The Academy Council has also been considering topics for the annual general meeting symposium in 2001. The Secretary (Biological Sciences), Professor John Young, with Professor Elspeth McLachlan and Professor Robert Symons, will prepare a proposal on biological research in the post-genomic era.

The Council will consider the topic for 2002 after next year's symposium. Suggestions are welcome.



At the US Academy

Dr Roger Summons, left, Chief Research Scientist of the Australian Geological Survey Organisation, with the Nobel Laureate and Foreign Secretary of the US National Academy of Science, Professor F. Sherwood Rowland. Dr Summons was introduced at the end of the US National Academy of Science ceremony at which Professor Peter Doherty was inducted on 24 April 1999. Had he not been in the USA, Dr Summons would have been admitted to Fellowship of the Australian Academy at its annual general meeting in April.

Forum on therapeutic cloning for tissue

The Academy's second consultative forum about the feasibility and ethical questions raised by the possible medical use of cloning technologies was held at Becker House on 16 September 1999 and judged by all who attended to be a very important meeting.

The meeting gave the first hint of a paradigm shift in the scientific possibilities for therapeutic cloning (that is, applications of cloning to medicine), as well as an eventual relief of many of the ethical problems posed by strategies using cells from the early human embryo.

The day focused on developments in the United States, the United Kingdom and Australia in the scientific potential of human embryonic stem cells for tissue replacement.

Professor Neal First, one of the two international keynote speakers, made two very forceful points:

- It could be expected that human embryonic stem cell lines could be grown up *in vitro*. Without the need for cell nuclear replacement technologies, these could be tissue-typed in much the same way as blood groups so that appropriate stem cell lines could be chosen for replacement tissue growth on a commercial basis. There was a suggestion this might be a multi-million dollar business.
- In allowing embryonic stem cell differentiation, the chemical 'factors' which guide the pathway for differentiation of these totipotent cells into specific tissue types were



Professor Neal First, from the University of Wisconsin

beginning to be identified. These 'factors' themselves might prove to be commercially important.

Professor First said that, overall, progress towards human cell therapies has been rapid. Examples of success, such as skin, blood cells and some brain cells, have reached clinical trials. Embryonic stem cell approaches are awaiting perfection and clinical trials. The potential for a new era of disease therapy is evident.

The second keynote speaker, Professor Martin Evans, emphasised the possible paradigm shift. He reported that the British Government had not yet accepted the report from the Human Genetics Advisory Commission recommending cell nuclear transfer (the transfer of DNA from the cell of an adult human to an enucleated egg for the growth of specific embryonic stem cells). He made the clear point that some of the ethical anxiety about these techniques (supported both by the Royal Society and the Australian Academy of Science in its position statement *On Human Cloning*) may well be removed because of new approaches.

Professor Evans challenged the meeting by saying that he believed that the de-differentiation of adult human cells back to the embryonic stem cell stage, or the totipotent stage, was a possibility within the next few years because of the rate at which science in this area was advancing. Such de-programming of any person's adult cells to the stage where, given a knowledge of the appropriate factors leading to the subsequent development, that cell could be taken to become any form of tissue immunologically compatible with the individual from which it came would be feasible.

Professor Evans illustrated the enormous potential of this development but warned that it would not be immediate; a 'bridge' needs to be built from our present knowledge of totipotent cells to the stage where they have become formed specific tissue. This identifies studies on human embryonic stem cells and the way in which they differentiate as being the key to using the de-differentiation process. The isolation of the specific chemical factors which lead to differentiation will be needed.



Professor Martin Evans, from Cardiff University

It was obvious from Professor Alan Trounson's talk that his work has allowed specific markers for human embryonic stems to be developed. He reported that *in vitro* growth of human embryonic stem cells had been carried out in Singapore, the cells themselves only differentiating when they are taken from the whole cell mass. He said cells resembling human cartilage, neuronal tissue, striated muscle, bone, and ciliated columnar epithelium (lung tissue) had all been observed in tissue from tumours in the skip mouse test using human embryonic stem cells. He reported that neuronal cell formation from the embryonic stem cells 'showed a very strong tendency'.

It was very exciting after this talk to hear from Dr Peter Rathjen about his experiments in Adelaide to control differentiation of embryonic stem cells. This talk showed that he had already identified the 'factors' for the mouse and that he had been able to purify them and to determine their molecular identity. Furthermore, Rathjen's work showed that, by using the specific factors, great specificity in the development of the embryonic stem cells was demonstrable. This control was specifically illustrated by a designed switch from mesoderm to ectoderm cells.

With this scientific background, the meeting turned to the Australian legislative and ethical framework within which developments here must be made. Associate-Professor Loane

Gene repair



Professor Alan Trounson, left, from the Monash Medical Centre in Melbourne, and Professor Roger Short, from the Royal Women's Hospital in Melbourne.

Skene, of the University of Melbourne, pointed out that under Victorian legislation (the *Infertility Treatment Act 1995*) there are several sections that might make work on human embryonic tissue a criminal offence. The Victorian prohibitions are more wide-ranging than the law in other states, even those that have legislation prohibiting human cloning. However, 'listening to discussion this morning',

she felt that the types of therapy being discussed, that did not require human embryos to produce stem cells, would be simply 'another type of experimental treatment'. Her advice would be to recommend the use of common law in respect of this treatment, focusing on the need for full information and consent, as for other medical experimental treatments, and not to regulate every aspect by legislation.

Dr Sandra Webb from Western Australia outlined her view of model legislation, which would clearly ban reproductive cloning, but leave therapeutic cloning of the kind being discussed theoretically permissible, but fully regulated. She commented that Western Australian and South Australian legislation currently regulating reproductive technology needed considerable amendment to fit this model.

The whole afternoon was spent discussing the ethical and legal matters raised by the extremely quick scientific developments reported in the morning and the expected possibility that differentiation of adult cells to a totipotent stage might become a reality.

John White
Secretary (Science Policy)

The Academy's position statement *On Human Cloning* is available on the Academy's web site at www.science.org.au/policy/statemen/cloning.htm. A summary of the forum will be available shortly.

Visions of future landscapes

The 1999 Fenner Conference on the Environment, *Visions of Future Landscapes*, was held in Canberra in May and generated substantial interest. The conference brought together 170 delegates from a range of fields, including science, conservation, economics, art, sociology, history and philosophy, in the hope of promoting an holistic perspective on Australia's choices for resource use and management.

The keynote speaker was Dr John



The Executive Director of the Bureau of Rural Sciences, Dr Peter O'Brien, left, with the Minister for the Environment, Senator Robert Hill, centre, and Professor Frank Fenner.

Ralston Saul, who spoke on 'Global drivers: how might they impact on Australia'. Other speakers included the Chairman of the Land and Water Resources Research and Development Corporation, Alex Campbell, who spoke on 'Australian landscapes without sheep' and Dr Doug Cox of the CSIRO, who spoke on future demographic trends and their impact on the environment. A statement by a commissioner of the Productivity Commission, Dr Neil Byron, on the slow rate at which government agencies are accepting ecologically sustainable development as a mainline practice, generated significant media interest.

The conference agreed on several issues:

- The attainment of sustainable resource management and the restoration of degraded environments will require a change in current practices.
- Accounting must involve social and environmental as well as economic considerations.

- Local communities and individual leaders will form the basis of any necessary change.
- The government sector has a crucial role but must work with the private sector and communities.
- The market cannot solve all social and environmental problems.

A book version of the conference proceedings is planned for publication next year.

The conference was organised by the Bureau of Rural Sciences under the auspices of the Academy of Science. Principal sponsors were the Land and Water Resources Research and Development Corporation, the Grains Research and Development Corporation, Environment Australia, the Australian Heritage Commission, the Murray-Darling Basin Commission and the ACT Historic Places Cultural Facilities Corporation.

For more information on the conference, contact Dr Ann Hamblin at the Bureau of Rural Sciences, email ann.hamblin@brs.gov.au.

Nova gets more mathematics

Several new topics have been added to the Academy's *Nova: Science in the news* web site (www.science.org.au/nova), including new topics in the mathematics series. The new topics include:

Stock markets – putting your money where your math is

Investor or not, the stock market affects everyone – and just a little simple mathematics can help explain those complicated-looking stock market tables in newspapers. This topic explains the meaning of the most commonly quoted stock market terms and figures.

Good prospects ahead for data mining

Every time you use an automatic telling machine, log on to the Internet, rent a video or even just make a phone call, a computer is recording details about you and your actions. This topic explores how sophisticated analytical tools have allowed data miners to turn this information into something useful. Topic sponsored by the Australian university mathematical sciences departments.

Conservation genetics – molecular detectives at work

Conservation biologists at the Cooperative Research Centre for the Conservation and Management of Marsupials have found that the tamar wallabies on New Zealand's Kawaii Island are descendants of a few South Australian wallabies released there in 1870, providing hope they can be used to re-introduce the animal to its original habitat, where it is extinct. This topic shows the relevance of conservation genetics. Topic sponsored by the Cooperative Research Centre for the Conservation and Management of Marsupials.

Generating new ideas for meeting future energy needs

Fossil fuels have provided the power that has driven massive change in the world over the past 200 years, but there is concern about pollution and the greenhouse effect, which has sparked increasing interest in other sources of energy, such as wave power, hydrogen and hot rocks.

Biomass – the growing energy resource

Scientists have had such success at

developing ways of extracting energy more efficiently from living material that there is now significant interest in biomass as a feasible future energy source.

Can we count on your vote?

There are a huge number of voting systems used around the world, all relying on mathematics to calculate the result of elections. This topic explains the calculations behind the preferential and proportional voting systems used in Australia. Topic sponsored by the Australian university mathematical sciences departments.

Sodicity – a dirty word in Australia

Soil sodicity is not well known in Australia, but it is a bigger problem than soil salinity, affecting almost one-third of Australian soils and causing poor water infiltration, surface crusting, erosion and waterlogging. Topic sponsored by the Cooperative Research Centre for Soil and Land Management.

The series of mathematics topics on *Nova* is sponsored jointly by the Commonwealth Department of Industry, Science and Resources and a group of 30 university mathematical sciences departments. The universities are:

- Australian Defence Force Academy
- Australian National University (two departments)
- Bond University
- Central Queensland University
- Charles Sturt University
- Deakin University
- Flinders University
- James Cook University
- La Trobe University (Bendigo and Bundoora campuses)
- Monash University
- Murdoch University
- Queensland University of Technology
- RMIT University
- Swinburne University of Technology
- University of Adelaide
- University of Canberra
- University of Melbourne
- University of New South Wales
- University of Newcastle

- University of Southern Queensland
- University of Sydney
- University of Tasmania
- University of Technology, Sydney
- University of Western Sydney
- University of Wollongong
- Victoria University.

The mathematics contents page on *Nova* (www.science.org.au/nova/maths.htm) contains a link to the mathematics departments of the above universities.

In recent months science coordinators and teacher librarians in 2500 high schools received promotional material on the *Nova* mathematics series.

The other new topics on *Nova* are sponsored by the Commonwealth Department of Industry, Science and Resources.

Ideas sought for new health in society topics

The Academy Council has approved use of the JS Anderson bequest as a matching grant towards developing five *Nova* topics on health in society. If any organisation has an idea for such a topic and \$2500, they should contact Nancy Lane on do@science.org.au.

Supported by the Australian Foundation for Science

Older women in science

A group of distinguished Australian female scientists aged 74 to 91 years met at the National Library of Australia in Canberra in September to celebrate the International Year of the Older Person. The group called on the Federal Government to increase funding for basic research in science and expressed concern about the focus on early returns from research instead of on research that would form the basis of further innovation. The group warned that failure to support fundamental research would leave Australia with 'yesterday's knowledge'.

New web site for the Dome

The Academy's Dome (Becker House) now has its own web site (www.science.org.au/dome). The site includes:

- a brief history of the Dome's construction, including statistics and a list of contractors
- a fascinating interview with the first Executive Secretary of the Academy, Jack Deeble, about the design and construction of the building (funded by an ACT Heritage grant)
- a personal memoir by the late Sir Otto Frankel, who was one of the Fellows overseeing construction
- a biographical memoir of the architect, Sir Roy Grounds (1905–1981)
- a list of architectural drawings (including the 1956 design commissions whose preservation has been funded by ACT Heritage and National Library of Australia Community Heritage grants)
- a response button enabling users of the site to send an email describing their early memories of the Dome.

Meanwhile the Academy Council has decided to proceed with high priority



The Academy's Dome (Becker House) now has its own web site.

renovation work. The consultants, Gutteridge Haskins Davey, categorised works into four levels of priority. Council authorised expenditure on the first two levels: works essential for safety or functional reasons, and works that were highly desirable. These works include air conditioning, two

new bridges over the moat, filtration of the moat, lighting in the moat, upgraded staircases and foyer, upgraded forecourt and pavement, new glazing, improved fire safety including a basement sprinkler system, and new electrical systems.

Caughley Fellow

The 2000 Graeme Caughley Travelling Fellowship has been awarded to Dr Peggy Rismiller, a wildlife ecologist from the Department of Anatomical Sciences at the University of Adelaide. She will use the fellowship to travel to Europe to present new ecological data on Rosenberg's goanna and the short-beaked echidna, share field experiences and exchange ideas with scientists in Europe.

As well as her position at the University of Adelaide, Dr Rismiller is Senior Researcher at the Pelican Lagoon Research and Wildlife Centre on Kangaroo Island. She is also the instigator and coordinator of Echidna Watch, a continent-wide survey providing a benchmark for the assessment and conservation management of echidna populations.

Scientists from various disciplines will be attending the 11th International Hibernation Symposium in Austria in August 2000. At that symposium Dr Rismiller will present new concepts

about the body temperature ecology of Rosenberg's goanna. This reptile is the largest native terrestrial predator on Kangaroo Island in South Australia. The species lives in a cooler climate than similar reptiles and regulates its body temperature by, among other means, spontaneous arousal from torpor.

She will then travel to the School of Veterinary Medicine in Hannover in Germany, where staff are undertaking ecological studies of small mammals. As a result of earlier collaboration with the school, Dr Rismiller has been investigating echidna food sources and circadian patterns in echidna activities and body temperature. She will present the results of a 10-year field study of echidna breeding ecology as well as her insights into reptile temperature regulation. These topics provide veterinary students with practical information for the husbandry of wildlife.

Zoos around the world are striving to improve habitats provided for wildlife and build captive breeding programs. The Frankfurt Zoo is one of the few zoos in the world that has a captive-bred echidna. Dr Rismiller will present an illustrated lecture on the ecology and biology of the echidna to the Frankfurt Zoological Society. The visit will also strengthen links between the zoo and Australian wildlife ecologists.

In September 2000 she will participate in the British Association Science Festival at the invitation of Earthwatch Europe. This is the biggest science festival in the UK and in 2000 is targeting young people. Dr Rismiller will speak on the challenges and rewards of working in the ecological sciences. Her echidna ecology research project has been supported by the Earthwatch Institute since 1991, and has attracted many international volunteers, including students, teachers and researchers from the UK.

Honours to Fellows

Professor Brian Anderson, the President of the Academy and Director of the Research School of Information Sciences and Engineering at the Australian National University, was awarded the Quazza Medal at the 14th International Federation of Automatic Control World Congress in Beijing in July. The prize was awarded for Professor Anderson's comprehensive contributions to control theory and his leadership of the organisation. The award is a memorial to the Italian control engineer, Giorgio Quazza.

Professor Ken Freeman, of the Mount Stromlo and Siding Springs Observatories of the Australian National University, has been awarded the American Astronomical Society's Dannie Heineman Prize for 1999 in recognition of his outstanding work in astrophysics. Professor Freeman has undertaken groundbreaking work on the structure of disc galaxies and the existence of dark matter in them.

Professor Noel Hush, of the School of Chemistry at the University of Sydney, has been elected a Foreign Honorary Member of the American Academy of Arts and Sciences in recognition of his contribution to chemistry. The Academy honours leading intellectuals in every field and profession and currently has 600 Foreign Members and 3500 Fellows.

Research journals

Following advice from the Chair of the Board of Standards of the Australian Journals of Scientific Research, Dr Hugh Tyndale-Biscoe, the Academy has changed some arrangements for the journals.

National Committee Chairs will be invited to include the Chairs of relevant journal advisory committees on their list of corresponding members. Advisory committees will be informed of relevant prior recipients of Academy honorific awards. Closer links will be encouraged between Australian and New Zealand journals. These and other arrangements will ensure better circulation of information between journal advisory committees and the Academy.

Clifford Emmens

Professor Clifford Emmens died on 22 June 1999, aged 85.

Clifford Walter Emmens was born in London on 9 December 1913. He was educated at Purley County School for boys and won a scholarship to the University of London's Agricultural College at Wye, but later attended University College, London where he was admitted to second year honours zoology with a physiology subsidiary.

Emmens broke off his study for a PhD in 1937 and took an MSc after being offered a place as a research biologist at the National Institute for Medical Research.

During the late 1930s and early 1940s, he helped to develop assay methods for male and female hormones and discovered synthetic precursors of oestrogens.

In the second world war Professor Emmens was seconded to the Royal Air Force where he studied the effects of bombing on morale in Germany, the Mediterranean, Normandy and Paris.

Analysis undertaken by a team headed by Professor Emmens (after the war) showed that Allied bombing had little effect on morale or production and that communications facilities would have been more effective targets.

Professor Emmens returned to the National Institute for Medical Research in 1946, assisting with experiments on the survival and activity of frozen sperm.

In 1948 Emmens' book, *Principles of Biological Assay* was published. In the same year, he was invited to establish a Department of Veterinary Physiology at the University of Sydney. He remained as its head for 30 years.

Professor Emmens' approach to building the department was to provide a high level of technical assistance, which resulted in rapid research progress. The department achieved a worldwide reputation and became the blueprint for several departments in other Australian universities.

He also continued work on biological statistics while at the department and promoted a number of biological and biochemical techniques.

In 1952, Professor Emmens accepted an invitation from the CSIRO to head the new Sheep Biology Laboratory at Prospect, but retained his position at

the university, serving in both roles for several years.

In 1953, he published the first of four books on aquariums, *Keeping and Breeding Aquarium Fishes*.

Professor Emmens' own work continued with the study of semen freezing, the work motivated by local demand for semen for sheep and cattle. In collaboration with Alan Blackshaw and ICA Martin, he published 15 papers on mammalian semen between 1950 and 1960.

In collaboration with RI Cox and L Martin, Professor Emmens discovered anti-oestrogens and then worked on their actions, which can include interference with early pregnancy. From 1957, he turned his attention towards oestrogenic activity and fertility.

Professor Emmens retired from the university in 1978. During his professional life, he also served as President of the Sydney Association of University Teachers, the Australasian Region of the International Biometric Society, the Endocrine Society of Australia and the Australian Society of Reproductive Biology. He had more than 200 scientific papers and several books published, principally on endocrinology, reproduction and biostatistics.

He was elected to Fellowship of the Academy in 1956.



Clifford Emmens

John Philip



John Philip

Dr John Philip died on 26 June 1999 when he was struck by a car while visiting the Centre for Mathematics and Computer Science in Amsterdam. He was 72.

Dr Philip was Australia's most distinguished environmental scientist, winning international acclaim for his work on the movement of energy, gas and water in the natural environment.

He was born in Ballarat on 18 January 1927. He undertook his early education at Maldon State School and won an open scholarship to Scotch College where his ability in science and

mathematics was recognised and where he also wrote poetry and studied modern literature. Philip's poetry appears in anthologies edited by Judith Wright and in *The Oxford Book of Australian Verse*.

Dr Philip matriculated at age 13 but had to wait until he turned 16 before being accepted to the University of Melbourne, where he spent his days, in his own words, 'drinking beer, playing billiards, pursuing a delightful girl (whom I later married) [and] reading everything I could put my hands on'. Aged 19, he graduated with a bachelor of engineering. He maintained a scepticism about formal, rigid education throughout his life and once told a group of graduands that his wish for them was simply that their 'curiosity stays lively'.

Dr Philip was employed by the university as a graduate assistant in agricultural engineering and seconded to a CSIRO research station at Griffith where he developed his fascination with the processes that move substances through the physical environment.

In 1953 he was contracted to the CSIRO's irrigation research station at Deniliquin where, at the urging of Professors Pat Moran and John Jaeger of the Australian National University, he was given the freedom to pursue his creative approach of applying physics and mathematics to environmental processes. He later said, 'The

consequence is that most of the time I've had great fun, being driven by curiosity to follow out various puzzles of the world around us.'

While at Deniliquin, Dr Philip wrote articles on the flow of heat and unsaturated water through porous media, including the thesis 'Physical contributions to microhydrology', which resulted in the award of DSc (Physics) from the University of Melbourne.

Dr Philip was Chief of the Division of Environmental Mechanics at CSIRO from 1970 until his retirement, except for three years as Director of the CSIRO Institute of Physical Sciences. In 1975 he chaired the Science Task Force of HC Coombs' Royal Commission on Australian Government Administration; the task force called for science to be led by curiosity rather than the market.

During his working life, Dr Philip published about 300 papers and was cited 4500 times. He was elected a Fellow of the Academy of Science in 1967 and of the Royal Society of London in 1974. In 1982 he became the first non-American to receive the American Geophysical Union's Robert E Horton Medal. For his services to hydrology, he was made Officer of the Order of Australia in 1998.

Dr John Philip is survived by his wife Frances, children Candida, Peregrine and Julian, and four grandchildren.

Bernhard Neumann celebrates 90 years

The first head of the Department of Mathematics in the Institute of Advanced Studies at the Australian National University, Professor Bernhard Neumann, celebrated his 90th birthday on 15 October.

Professor Neumann was born in Berlin-Charlottenburg, Germany, in 1909 and studied in Berlin before moving to England in the 1930s in pursuit of greater intellectual freedom.

At the invitation of Sir Mark Oliphant, he left England in 1962 to establish a mathematics department within Oliphant's physics school at the Australian National University.

Professor Neumann was head of the Department of Mathematics in the Research School of Physical Sciences for 12 years, from 1962 to 1974, and was made Emeritus Professor and Honorary Fellow at the Australian National University in 1975. He was elected to Fellowship of the Academy in 1964.

The transcript of a recent interview with Professor Neumann is on the Academy's web site at www.science.org.au/educatio/bn.htm.

Professor Bernhard Neumann



Wark Medal presentation

Every two years the Academy presents its prestigious Wark Medal to a scientist whose work has benefited the community. The medal and the accompanying lecture commemorate the work of Sir Ian Wark, a former Chief of the CSIRO Division of Industrial Chemistry.

The 1998–99 medallist was Professor Tom Healy, Director of the Advanced Mineral Products Special Research Centre at the University of Melbourne. Some information on the research that won him the award is available at www.science.org.au/academy/media/wark99.htm.

The medal was presented at a dinner in Melbourne on 25 August 1999. After dinner, Professor Healy delivered his Wark Lecture on the topic, 'Industrial chemistry, university research and fishing', greatly entertaining those present.

In the lecture he described his introduction to Wark's field of mineral processing and some of the industrial chemists who had worked in it. 'It was only years later that I really noticed something about people like Wark, Sutherland, Nixon, Hill, Howard Worner and Bill Trahar: each made spectacular advances in industrial chemistry with clear and obvious economic outputs, yet each was a giant in very basic chemistry and physics – angels on the head of a pin stuff.'

He traced changes in priorities at CSIRO which had seen Wark's Division of Industrial Chemistry change its name to Applied Chemistry, Applied Organic Chemistry, Chemical Technology, Chemicals and Polymers, and in 1997 to CSIRO Molecular Science. He saw this as 'the heritage of a base of first class scientists responding to needs and priorities facing Australia and Australians'.

Professor Healy made a number of amusing observations on his experiences supervising higher degree students. While he provided the physical and intellectual environment, the students controlled their studies, in many different ways and over different periods.

He said, 'In reading the 'Research Training' section of the Green Paper [on higher education research and research training], I did not see anything like this picture. Rather the insistence is that a research degree can be 'programmed'



The President of the Academy, Professor Brian Anderson, left, presenting the Wark Medal to Professor Tom Healy.

into stages adding up to three (maximum three and a half) years. Such a programming of research education for each and every student is ludicrous and demonstrates a real lack of understanding of the business I have been in for many years.'

He also found much to agree with, such as the priority given to links with other parts of the research and innovation sector. 'In the sixties I was punished because part of my research was linked to the end-users of knowledge generated in the group.'

He queried whether university teaching and research could be separated, since, without extra funding, extra time spent on one would inevitably reduce the time

available for the other.

'Anyone who is an innovator needs thinking time,' he said. Dr Wark went fly fishing. Professor Healy and Dr Bob Hunter established student conferences, conducted in a relaxed and informal setting. 'Green papers seem to miss the essential human dimension...going fishing might be just as valuable as going to the library.'

Finally he told some anecdotes from his long collaborations with field geologists, paint manufacturers and other scientists. 'Innovation where you seek incremental improvement in major, mature processes or products means that you have to be in for the long haul and you have to be a team player.'



At the Wark dinner in Melbourne were Sir Ian's secretary, Eleanor Balding, left, Sir Ian's daughter, Elizabeth Stedwell, right, and her husband, Keith Stedwell.