



# Setting research priorities

The Academy of Science has played a leading role in coordinating the four Academies in the consultations on setting national research priorities.

On 29 May the Academy organised a scoping workshop, chaired by the Commonwealth's Chief Scientist, Dr Robin Batterham, and attended by 24 participants from the Academies, research organisations, government and research funding agencies.

On 26 June, the Academy's Secretary (Science Policy), Professor Michael Barber, delivered the televised Telstra Address, *Research Priorities for Australia: Setting our Future*, to the National Press Club in Canberra.

The Telstra Address was followed by a strategic forum on research priorities at the Shine Dome. Speakers at the

forum represented the Academies, the Commonwealth, the states, industry, research agencies and research funding agencies. A range of issues was presented for consideration on how Australia should approach the important task of setting national research priorities. The presentations set the scene for constructive discussion and debate.

Members of the Commonwealth Government's Consultative Panel on National Research Priorities attended the forum.

The speaker at the forum dinner was the Minister for Science, Mr Peter McGauran. He gave an engaging and informative address during which he encouraged, and responded to, questions from guests.

The program for the forum, including

CVs and abstracts for speakers, is available on the Academy's website at [www.science.org.au/nrp.pdf](http://www.science.org.au/nrp.pdf). The proceedings will also be made available on the Academy's website.

In his Telstra Address, Professor Barber noted that the Academy had a policy that the national government should set broad directions for government research agencies and funding programs. One argument for this was that Australia, as a small economy, had to focus on strengths and build in niche areas. A second argument was that the money invested in research should be invested wisely and not spread too thinly.

Professor Barber said that perhaps the best argument for research priorities was

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## New President for Academy

At the Academy's annual general meeting on 2 May 2002, Fellows welcomed Dr Jim Peacock as their new President. Dr Peacock, Chief of CSIRO Plant Industry, is one of Australia's most eminent plant geneticists, with a long record of applying basic research in plant molecular biology to agriculture.

He was elected to the Academy in 1976 and shared, with Dr Liz Dennis, the inaugural Prime Minister's Prize for Science in 2000. He has served on the Australian Research Grants Committee and the Prime Minister's Science, Engineering and Innovation Council, and is a Companion of the Order of Australia.

Of his election, Dr Peacock said, 'It is an honour to have been elected President of the Australian Academy of Science and I will be working hard throughout the next four years to promote the role of science in contributing to Australia's prosperity.'

In his farewell address to Fellows and guests on the same day, the outgoing President, Professor Brian Anderson, reflected on the current state



Brian Anderson, right, hands Jim Peacock the President's gavel.

of science research and education in Australia. He particularly commented on setting national research priorities and the review of universities. He spoke of the challenges of creating world class

universities and the need to get away from formulaic funding.

The full text of Professor Anderson's address is available at [www.science.org.au/academy/media/president.htm](http://www.science.org.au/academy/media/president.htm).

## Office-bearers of the Academy

### President

Dr Jim Peacock

### Secretary (Physical Sciences)

Professor Bruce McKellar

### Secretary (Biological Sciences)

Professor John Shine

### Secretary (Science Policy)

Professor Michael Barber

### Foreign Secretary

Professor Kurt Lambeck

### Secretary (Education and Public Awareness)

Professor John McKenzie

### Treasurer

Professor Ian McDougall

## Telephone numbers

Executive Secretary	(02) 6247 5777
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Awards	(02) 6247 5777
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Library	(02) 6247 9024
Australian Foundation for Science	(02) 6247 5777
Fax	(02) 6257 4620
Email	<a href="mailto:aas@science.org.au">aas@science.org.au</a>

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

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# Higher education review

The Academy made a submission in June to the Commonwealth government's review of higher education. The Minister for Education, Science and Training, Dr Brendan Nelson, earlier issued a discussion paper, *Higher Education at the Crossroads*.

The Academy's submission made five key points:

- A higher education funding council should be established to improve planning and dialogue between universities, the Commonwealth government and the private sector.
- The policy objective should be to have a pluralistic system in which each institution defines its own role.
- Performance measures of the

excellence and socio-economic impact of research should be used to allocate government resources and to help students and research partners make informed choices.

- The funding system for research infrastructure should be simplified to reduce administrative costs.
- Better science curriculums and more good science and mathematics teachers are needed to improve public scientific literacy and prepare future scientists. Science teacher scholarships should be introduced.

The full submission is available from the Academy's website at [www.science.org.au/academy/media/28June02.htm](http://www.science.org.au/academy/media/28June02.htm).

# Human cloning Bill

As the federal Parliament considers a Bill on human cloning and embryo research, the Academy has made a submission questioning whether legislation is the appropriate means of regulating research.

In June the Academy's spokesperson on human cloning and stem cell research, Professor John White, wrote, 'Legislation is an imperfect vehicle for responding to the rapid changes in

scientific procedures and techniques and to less rapid changes in public opinion.' He suggested that if a National Health and Medical Research Council Licensing Committee is established under the Act, then the committee should have broad powers to regulate embryo research.

The submission is available from the Academy's website at [www.science.org.au/academy/media/21June02.htm](http://www.science.org.au/academy/media/21June02.htm).

## Forthcoming events

- Climate and culture in Australia, National Academies Forum conference, Shine Dome, 25 to 27 September – for more information see [ozhistory.info/weather](http://ozhistory.info/weather).

## New topics on Nova

- Bitumen battles – the phenomenon of road rage
- Virtual reality bytes – military uses of VR
- Quiet please! Fighting noise pollution

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

## Award deadlines

Junior awards 30 August 2002

Senior awards 30 August 2002

For more information see

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

## International exchanges

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

## Basser Library

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

## Gifts to the Academy

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

# Honours to Fellows

The Swiss Academy of Engineering Sciences has elected the Commonwealth government's Chief Scientist, **Dr Robin Batterham**, a Corresponding Member.

The French Academy of Science has elected the Director of the Walter and Eliza Hall Institute of Medical Research, **Professor Suzanne Cory**, as an Associate Foreign Member. Professor Cory is the first Australian woman to be so honoured.

The Ian Clunies Ross Memorial Foundation has made a special lifetime achievement award to **Professor Frank Fenner**, of the Australian National University, 'for a life spent fighting viruses, malaria, rabbits and culminating in the global eradication of smallpox'.

The Royal Society of London has elected two Fellows of the Academy, **Professor Graham Goodwin** and **Professor Bruce Kemp**, to its ranks. Professor Goodwin is the Director

of the Centre for Integrated Dynamics and Control at the University of Newcastle. Professor Kemp is the Deputy Director and NHMRC Senior Principal Research Fellow at St Vincent's Institute of Medical Research at the University of Melbourne. The Royal Society also elected a Corresponding Member of the Academy, **Professor Peter Raven**, Director of the Missouri Botanical Garden.

The President and Executive Director of the Biosphere 2 Center of Columbia University in Arizona, **Dr Barry Osmond**, has been elected to the German Academy of Researchers.

The Iron and Steel Society will present its 2002 Benjamin F Fairless Award to **Professor Howard Worner** later this year. The award, the most prestigious award of the international steel industry, recognises distinguished achievement in iron and steel production and ferrous metallurgy.

## Queen's Birthday honours

Two Fellows of the Academy were made Members of the Order of Australia (AM) in the Queen's Birthday honours list in June 2002.

**Professor Ronald Brown**, of Monash University, was honoured 'for service to chemistry and chemical research, particularly spectroscopic work on molecules, to education in the areas of curriculum development, teaching and as an administrator, and to the community'.

**Professor George Szekeres**, of the University of New South Wales, was honoured 'for service to mathematics and science, particularly as a contributor to education and research, to the support and development of the University of New South Wales Mathematics Competition and the Australian Mathematical Olympiad Team'.

## Setting research priorities

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that by focusing the scientific effort Australia's science system could be sustained and improved. Interactions between disciplines and organisations could be enhanced.

'Even more importantly, if the priorities are sufficiently visionary and their possible outcomes clearly articulated, they should enable the science community to engage with its major stakeholder – society,' Professor Barber said. 'For our science to be sustainable it must lead to jobs, better health, a cleaner environment – in short, a better world.'

He said that the Academy had nominated three broad thematic priorities for Australian research and development: population ageing, wealth generation and environmental sustainability. Wealth generation should specifically include biotechnology, nanoscale material science and information and communications technology.

Because of the interdependence of fields of research, he said it was difficult to identify any significant scientific disciplines that Australia could do without. As an example he observed that a science advisory

*The Minister for Science, Peter McGauran, left, with Michael Barber at the strategic forum hosted by the Academy.*



body's workshop in 1981 decided that immunology and virology warranted low priority. A few years later Australia's strength in these areas allowed a quick response to the arrival of AIDS.

Professor Barber also warned against targeted research. Setting the target is limited by the current state of knowledge.

'Whatever we decide, it is vital that the priorities are sustained over time,' he said. A leading position in a scientific field takes decades to establish.

Professor Barber's paper is available on the Academy's website at [www.science.org.au/academy/media/26June02.htm](http://www.science.org.au/academy/media/26June02.htm).

## Teachers and young researchers at Academy

Teachers and early-career researchers from around Australia attended special programs during the Academy's Science at the Shine Dome from 1 to 3 May 2002.

They joined Academy Fellows at the new Fellows seminar, awards presentation, annual dinner and the symposium on sustainability. Teachers

also had a workshop on innovative teaching methods. The young researchers had a workshop on career development which discussed news media, writing grant proposals and commercialising research.

Both the teachers and researchers responded positively to participating in the events.



The Academy's Secretary (Education and Public Awareness), John McKenzie, left, and Peter Russo, second left, from the Australian Science Teachers Association, with teachers at Science at the Shine Dome. The teachers are, from third left, Gerard Houlihan, Mary Rowland, Tony Dierks, Gary Thomas, Stephen Fogwill, Peter Tuohy, Toni-Anne Carroll.

## Research reactor needed

The Academy has welcomed the decision to build a new research reactor to replace the one at Lucas Heights near Sydney.

The Academy's Secretary (Science Policy), Professor Michael Barber, said that the investment was needed in the national interest, to continue internationally recognised research, and to strengthen links between

industry and research. 'A state-of-the-art research reactor is critical to the national interest, both in developing a radiopharmaceutical industry in health care and in maintaining the excellence of Australian research.'

He said that the reactor would benefit a wide range of industry and society.

## New emphasis on public awareness

The Academy has created a new position on its Council to promote public awareness of science. The first to hold the position of Secretary (Education and Public Awareness) is Professor John McKenzie.

Professor McKenzie is Dean of the Faculty of Science at the University of Melbourne. He has studied the genetic response of natural populations to environmental change, using

insecticide residues in the Australian sheep blowfly, *Lucilia cuprina*, as a model. His work has improved understanding of the environmental circumstances that provoke a genetic response and provided a conceptual basis for the management of pesticide resistance.

He has also contributed to science education and communication.

He is pictured opposite.

## Academy welcomes Batterham reappointment

The Academy has applauded the reappointment of the Commonwealth government's Chief Scientist, Dr Robin Batterham, for a further three-year term.

The President of the Academy, Dr Jim Peacock, said, 'Dr Batterham has worked exceptionally hard to put science and technology at the forefront of the national agenda. The Academy is delighted that Robin has agreed to continue in the role of Chief Scientist.'

He added, 'Dr Batterham is highly regarded by the business and science communities, having a track record as a research scientist in both the public and private sectors.'

Dr Batterham is also managing director of research and technology support for Comalco and chief technologist of Rio Tinto.

## International exchanges renewed

The Academy has negotiated a new contract with the Commonwealth Department of Education, Science and Training to fund its exchange program for the next four years. The new contract includes a boost to funding for these activities.

The program funds Australian scientists' short visits to Asia, North America and Europe. It supports collaborative research with scientists in those continents and access to leading-edge small to medium research facilities and equipment.

For exchanges information, applications and deadlines visit [www.science.org.au/internat/index.htm](http://www.science.org.au/internat/index.htm).

## Peter Raven visits

The Director of the Missouri Botanical Garden, Professor Peter Raven, and his wife, Professor Patricia Raven, visited the Academy in June. Professor Raven is a Corresponding Member of the Academy and a well known conservationist.

# New members of Council

**Professor John Shine** is the new Secretary (Biological Sciences). He is Executive Director of the Garvan Institute of Medical Research in Sydney. He discovered the genetic sequences that signalled the initiation and termination of protein synthesis. He developed new genetic techniques and cloned the genes for insulin and human growth hormone. He played a major role in the successful production of these proteins by bacteria for medical treatment.

**Professor John McKenzie** is the new Secretary (Education and Public Awareness). See story on opposite page.

**Professor Suzanne Cory** is a Council member in the biological sciences. She is Director of the Walter and Eliza Hall Institute of Medical Research in Melbourne. Professor Cory has conducted research into the genetic

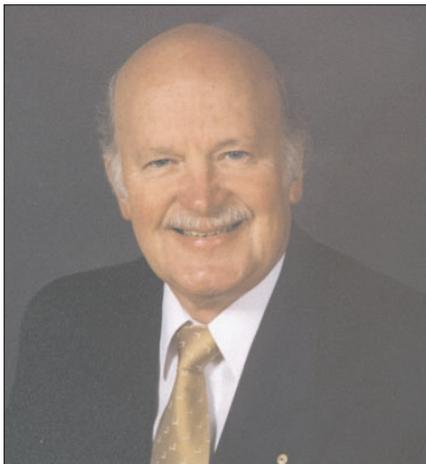
mistakes that cause cancer. Her laboratory has tracked down the mutation that leads to Burkitt's lymphoma. She has also studied the process of programmed cell death and its implications for cancer development.

**Professor Graham Goodwin** is a member in the physical sciences. He is the Director of the Centre for Integrated Dynamics and Control at the University of Newcastle. His work on systems science and control theory has had a major international impact. He has linked fundamental theoretical research with engineering applications.

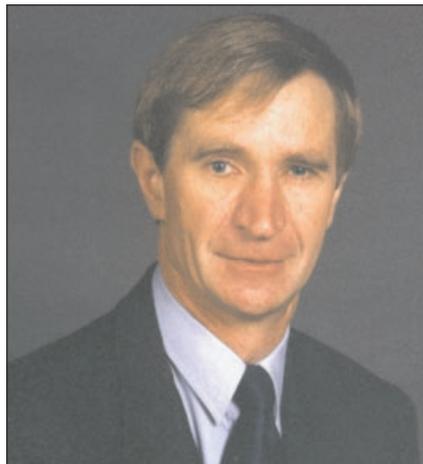
**Professor David Kemp**, the Head of the Malaria Biology Laboratory at the Queensland Institute of Medical Research, has been appointed by Council to fill a casual vacancy in the biological sciences. He has devised

a number of techniques used in molecular biology. These have helped him gain understanding of the biology of malaria and other infectious diseases. He has played a major role in defining malaria antigens and extending knowledge of the malaria genome.

**Emeritus Professor Andrew Smith** is a member in the biological sciences. He is from the University of Adelaide. His research has concentrated on membrane transport in plant cells and plant nutrition. He has also studied the interactions between plants and microbes in the soil, including the mycorrhizal associations of plants and fungi. He is interested in the development of international links in research, especially with Southeast Asia, China and Europe.



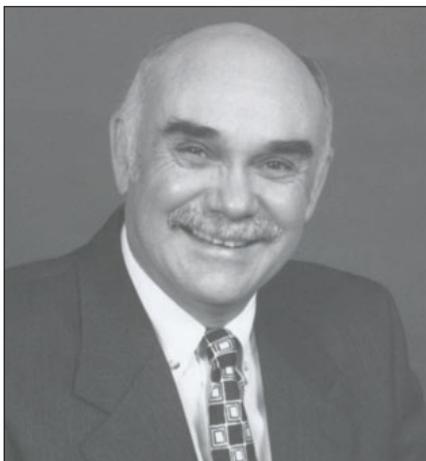
John Shine



John McKenzie



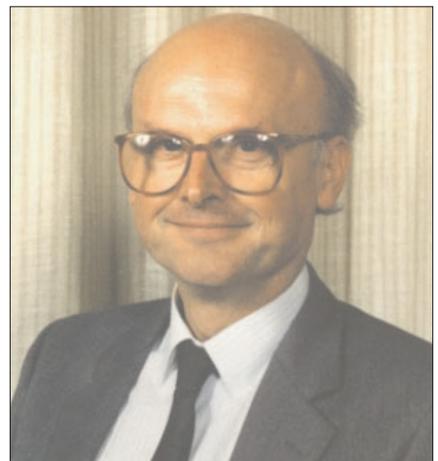
Suzanne Cory



Graham Goodwin



David Kemp



Andrew Smith

# Academy medallists

Each year at its annual general meeting the Academy presents awards recognising research achievement. This year the awards for senior scientists were the Flinders, Craig and Mawson Medals. The awards for younger scientists were the Hill Award and the Fenner, Gottschalk and Pawsey Medals. The seven awards were presented on 2 May 2002.

## Flinders Medal and Lecture

for research in the physical sciences

*Professor Alan Sargeson FAA*

Professor Sargeson is a chemist from the Australian National University. After gaining a PhD from the University of Sydney, he was appointed to a lectureship at the University of Adelaide. He then helped set up the Biological Inorganic Chemistry Unit in the John Curtin School of Medical Research at the Australian National University. Since 1967 he has been at the Research School of Chemistry.

Professor Sargeson is renowned for his research on the structure, properties and biological significance of coordination complexes, which are metal ions enclosed in organic cages. He showed how metal ions can profoundly influence both the rates and the pathways for some organic reactions. This led to new syntheses of

amino acids, polyamines and organic cages, where the metal ion plays a role as a template. Some complexes have the potential to act as anti-cancer agents, as diagnostic agents, as new types of detergent and as a new type of anti-viral agent. They could also be used to capture and remove some toxic metals. Currently the anti-cancer and diagnostic aspects are being explored and some of the molecules have been patented.

Due to Professor Sargeson's ill health, the Flinders Lecture was presented by Dr Jack Harrowfield from the University of Western Australia. The lecture, titled 'Chemistry encapsulated – making and mastering metallomolecules', focused upon the highlights of the chemistry of metals when they are trapped in encapsulating molecules.

It went on to say that coordination chemistry, with applications in mining and cancer treatment, is one of the grand themes of chemistry in Australia. Professor Sargeson's diverse interests, enthusiasm for chemistry in the laboratory, persistent curiosity and ability to work constructively with others have helped him make massive contributions to fields such as biology (enzyme function and electron transport), the treatment of disease and sophisticated chemical synthesis.

## David Craig Medal

for research in chemistry

*Professor Lewis Mander FAA*

Professor Mander is in the Research School of Chemistry at the Australian National University. He is distinguished for his outstanding research in the area of synthetic organic chemistry and particularly for his major contributions to the development of new methods and strategies for assembling complex organic molecules. His trailblazing synthesis of gibberellic acid attracted great international attention. He is acknowledged as the world leader in the chemistry of gibberellins and related compounds, which are of great practical significance as plant growth hormones.

## Mawson Medal

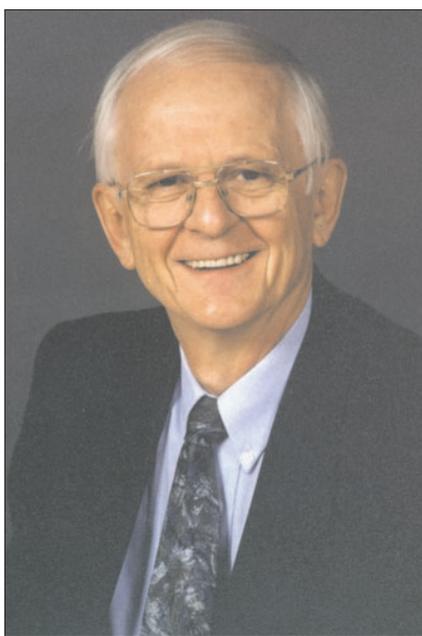
for research in the Earth sciences

*Professor Allan White*

Professor White is a visiting professor in the Department of Earth Sciences at the University of Melbourne. He is internationally renowned for his research on granites. Most notably, it was his mapping and careful field observations in the Kosciuszko region that led to the recognition that many of the granites of that area are S-type granites. These are a distinct variety derived from the partial melting of



Alan Sargeson



Lewis Mander



Allan White



Annette George

sedimentary rocks deep in the Earth's crust. S-type granites have since been recognised on all the continents.

#### **Dorothy Hill Award**

for research in the Earth sciences

*Dr Annette George*

Dr George is a senior lecturer in the Department of Geology and Geophysics at the University of Western Australia. She has wide-ranging interests in sedimentary research. Her work on the Devonian reef complexes of the Canning Basin

is providing new insights into basin history and the role of tectonism in reef evolution. She is an enthusiastic and dedicated teacher.

This is the inaugural Dorothy Hill Award.

#### **Fenner Medal**

for research in biology, excluding the biomedical sciences

*Dr Sandra Orgeig*

Dr Orgeig is an Australian Research Council Research Fellow in the Department of Environmental Biology at Adelaide University. She has received wide recognition for her research into the role of cholesterol in pulmonary surfactants. Pulmonary surfactants control the surface tension of the fluid lining the inner lung. Failure of the surfactant system leads to respiratory distress.

She was the first to demonstrate that the cholesterol content of surfactants is highly dynamic in mammals, changing in response to ventilation, temperature and exercise, and that this has important consequences for surfactant and lung function.

#### **Gottschalk Medal**

for research in the medical sciences

*Dr Merlin Crossley*

Dr Crossley is a senior lecturer in the Department of Biochemistry at the University of Sydney. He has made major contributions to our understanding of the molecular mechanisms by which gene expression can be turned on or off in mammal cells. His work has significant potential for the treatment of diseases such as sickle-cell anaemia and beta-thalassaemia.

#### **Pawsey Medal**

for research in physics

*Dr Sergey Vladimirov*

Dr Vladimirov is an Australian Research Council Senior Research Fellow in the School of Physics at the University of Sydney. He has helped pioneer Australian studies of complex plasmas – a rapidly growing area of research involving laboratory and industrial plasmas, astrophysics and space physics. His main contribution is in the theory of the collective behaviour of charged particles in plasma when it is in a non-equilibrium state.

Nominations for the Academy's 2003 awards close on 30 August 2002. For more information see [www.science.org.au/awards/awards.htm](http://www.science.org.au/awards/awards.htm).



Sandra Orgeig



Merlin Crossley



Sergey Vladimirov

## New Fellows



Michael Archer

Sixteen of Australia's leading scientists were honoured by election to the Fellowship of the Academy in March. Election recognises a career that has significantly advanced the world's store of scientific knowledge. The new Fellows are listed below.

**Professor Michael Archer**, *Director, Australian Museum, Sydney*

Professor Archer has made important contributions to the anatomy, taxonomy and evolutionary history of Australian marsupials and monotremes. For the past 25 years he has led a large team which has been working at the enormously rich fossil beds of the Riversleigh World Heritage Site in northwestern Queensland. Information from these beds has transformed our knowledge of mid- to late-Tertiary Australian vertebrates. From material discovered at Murgon in southeastern Queensland, he and his team described the first early Tertiary Australian mammals. From material located at Lightning Ridge in northern New South Wales, they described Australia's first Cretaceous mammals. An enthusiastic researcher, his extensive knowledge of changes in the fossil record has made him a strong advocate of innovative land-use strategies that will enhance the survival of Australia's living biota.

**Professor Murray Esler**, *Associate Director, Baker Medical Research Institute, Melbourne*

Professor Esler has developed a unique method using radioactive tracers to study the sympathetic nervous system, the branch of the nervous system that allows our bodies to prepare for fight or flight. This method has allowed Professor Esler to show that enhanced activity of the sympathetic nervous system is probably the major mechanism initiating high blood pressure. His method allows quantification of the

activity of the sympathetic nervous system over time, and has been widely adopted internationally. It was used in the 1998 studies of neural circulatory control on board the space shuttle Columbia. His work has also been pivotal to providing the theoretical basis for the recent successful use of beta blockers in the treatment of heart failure.

**Professor Robin Evans**, *Professor of Electrical Engineering, University of Melbourne*

Over the past 25 years Professor Evans has made a number of seminal contributions to the field of systems control and signal processing. Engineering systems such as telecommunications control and multiple target tracking with radar are typically complex, nonlinear and difficult to model. His work has been important in developing the areas of target tracking theory, control theory and filtering theory – used to design and develop large interconnected and distributed systems. He introduced the idea of what is termed an envelope-constrained filter, which has become a major area of study. His algorithms and techniques are used widely in communications and radar technology.

**Professor Christopher Goodnow**, *Director, Medical Genome Centre, John Curtin School of Medical Research, Australian National University*

Professor Goodnow has pioneered the use of mouse molecular genetics for studying the mechanisms of immunological tolerance to self antigens, the ability of the immune system to recognise its own normal tissues and body fluids as self. He devised a novel system to genetically modify mice that has become widely used in immunology. He led a team that combined this new approach with classical immunology, mouse mutants, biochemical analysis and



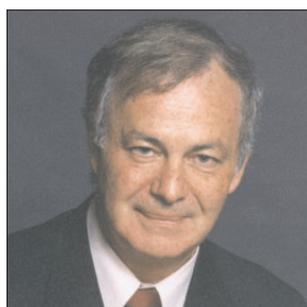
Murray Esler



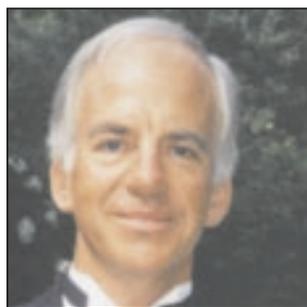
Robin Evans



Christopher Goodnow



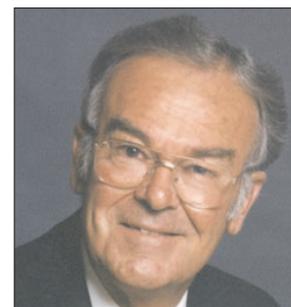
Robert Graham



Anthony Guttman



John Hutchinson



John Jacobsen

gene-expression profiling on DNA arrays to illuminate the process of self-nonsel discrimination by the immune system. His work changed the conceptual framework of self-tolerance by showing that it is acquired through a series of regulatory checkpoints at many steps in the maturation of lymphocytes, or immune cells. The elucidation of these peripheral tolerance checkpoints has fostered practical efforts to induce or restore tolerance in adults during transplantation and autoimmunity.

**Professor Robert Graham**, *Executive Director, Victor Chang Cardiac Research Institute, Sydney*

Professor Graham has been a pioneer in molecular cardiology. Through his development of novel biochemical approaches and molecular strategies in a chemical context, he has provided insights into the function of the adrenergic system, a part of the nervous system that regulates our involuntary reactions to stress. His work on the action of the drug prazosin in relation to hypertension has led to an elucidation of the structure of alpha-adrenoceptors and their mode of action in cells, the discovery of several subtypes of these receptors and some of their cardiovascular functions. These findings have influenced concepts of receptor activation theory and provided new approaches for drug design.

**Professor Anthony Guttmann**, *Professor of Mathematics, University of Melbourne*

Professor Guttmann is widely recognised internationally for his outstanding contributions to computational applied mathematics. He is a major authority on the generation and analysis of power series expansions with applications in many areas of science including statistical mechanics, enumerative combinatorics, fluid mechanics and polymer chemistry. He has developed new and innovative

algorithms and methods for the generation and analysis of series expansions that are now recognised as the industry standard.

**Professor John Hutchinson**, *School of Mathematical Sciences, Australian National University*

Professor Hutchinson has made fundamental contributions in an unusually broad array of mathematical areas, ranging from logic, through analysis and geometry to computational methods. He is particularly famous for his pioneering mathematical research on fractals which has had an impact in many applied areas.

**Dr John Jacobsen**, *Chief Research Scientist, CSIRO Plant Industry, Canberra*

Dr Jacobsen is internationally renowned for his contributions to plant science in the field of hormone action in plant cells. He studied the gene for the enzyme alpha-amylase in barley to determine how the plant hormone, gibberellin, regulated gene expression. He found that gibberellin action involved new protein and messenger RNA synthesis. At the gene level, he identified parts of the alpha-amylase gene that mediated gibberellin control and identified a transcription factor that binds to the promoter of the alpha-amylase gene. This interaction between DNA and protein is a major component of the pathway by which the presence of gibberellin is transformed into physiological changes within a cell. Dr Jacobsen has applied this knowledge to the genetic engineering of barley in order to improve malting quality.

**Professor Yuri Kivshar**, *Research School of Physical Sciences and Engineering, Australian National University*

Professor Kivshar has established

himself as a world leader in the study of the behaviour of light, particularly in the modern field of nonlinear optics. He has developed the theory of self-trapped beams for all-optical switching devices, which is of central importance to the emerging field of photonics, where light is used in information processing and communications. He has also advanced the theory of solitons – nonlinear localised waves which propagate unchanged over large distances. He has worked closely with several experimental groups in verifying many of his predictions.

**Professor Pauline Ladiges**, *School of Botany, University of Melbourne*

Professor Ladiges is distinguished for her studies of the classification, the geographical distribution and the ecology of Australian plants. She is best known for her innovative approach to resolving uncertainties about the classification and naming of Australia's most important group of trees, the eucalypts. She was the first to employ DNA sequence comparison to establish definitively the relationships of the major groups of eucalypts and to develop the basis of a robust classification, which is important to both industry and biodiversity conservation. The methods she has developed for studying the geographical distribution of plants represent a major theoretical breakthrough. These methods are used to reconstruct evolutionary relationships of different plant groups and to understand the biogeographic history of areas that are home to species found there and nowhere else.

**Professor Eugenie Lumbers**, *School of Medical Science, University of New South Wales*

Professor Lumbers is an internationally respected authority on foetal and maternal physiology. Her work for many years has been in cardiovascular and renal physiology, with particular reference to blood pressure regulation by the renin-angiotensin system. Her original discovery that blood and amniotic fluid contain an inactive form of the enzyme renin is a landmark in the understanding of the renin-angiotensin system. Her finding that oestrogens in contraceptive pills increase renin substrate production is fundamental for understanding blood pressure



Yuri Kivshar



Pauline Ladiges



Eugenie Lumbers

## New Fellows

regulation in women. Her many original and important experiments have shown the widespread involvement of the renin-angiotensin system in pregnancy, in the control of maternal and fetal blood pressure, and in the regulation of fetal renal function.

**Professor Suzanne O'Reilly**,  
*Geochemical Evolution and Metallogeny of Continents Key Centre, Macquarie University*

Professor O'Reilly is an international leader in studies of the properties and evolution of the lithosphere using mantle-derived magmas and xenoliths. She has made major discoveries in understanding the geochemical and physical nature of the lithosphere, the evolution of its boundaries, the origin and ascent of magmas and other fluids from the mantle, the thermal structure of the continents, and the processes that shape the various domains of the lithosphere in space and time.

**Dr Ezio Rizzardo**, *CSIRO Molecular Science, Melbourne*

Dr Rizzardo has an outstanding record of achievement in the invention and development of new chemical tools for designing and engineering the ways in which small organic molecules link together to form the large clusters known as polymers, which are large organic molecules. Polymers made by conventional methods are a tangled mass of chains of different lengths, with the lengths of the chains helping to determine the properties of the polymer. Dr Rizzardo's work on free radical polymerisation has the potential to revolutionise the way that polymers are made since it enables manufacturers to control the lengths of the polymer chains and the pattern in which they link together as they grow.

**Professor Tamarapu Sridhar**,  
*Department of Chemical Engineering, Monash University*

Professor Sridhar has solved an outstanding problem in the science of large molecules, particularly polymers, by conceiving the filament stretching rheometer for measuring the elastic and flow properties of these materials. This significant breakthrough led to counterintuitive results and to a new understanding of the shape changes in a macromolecular chain during deformation. His breakthrough has triggered work in new areas, and

several laboratories use his measurement technique. His contribution to practical engineering involving reactions between materials in different phases illuminates the inter-relationship between mass transfer and chemistry in industrially important reactions.

**Professor Fiona Stanley**, *Director, TVW Telethon Institute for Child Health Research, University of Western Australia*

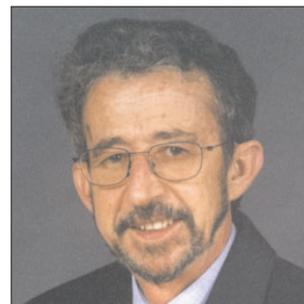
Professor Stanley is a world leader in the area of perinatal epidemiology. She developed a unique collection of obstetric and child health records then applied statistical methods to the records to investigate the causes and prevention of major childhood diseases. She and her colleagues showed that dietary folic acid, taken early in pregnancy, can prevent spina bifida in babies. She has also demonstrated that the most common cause of cerebral palsy is not the result of the lack of oxygen at birth, as previously thought, but the result of events early in pregnancy. Another area of her research is to discover the causes and lifelong consequences of low birth weight. Her studies have led to new ways of thinking about and analysing cause in epidemiology.

**Professor Robert Sutherland**,  
*Cancer Research Program, Garvan Institute of Medical Research, Sydney*

Professor Sutherland has a distinguished research record in the molecular and cellular biology of hormone-dependent cancers, such as breast cancer. He is widely recognised internationally for his pioneering work in understanding how sex steroids, such as oestrogen, and their antagonists control the progression of the life cycle of a cell. His work on the molecular genetics of breast cancer and fundamental studies on the control of breast cell proliferation and differentiation has been a major contribution to the study of the causes of human breast cancer. His research on elucidating the mechanism of action of oestrogen antagonists has substantially underpinned the development of important therapies in the area of women's health.



Suzanne O'Reilly



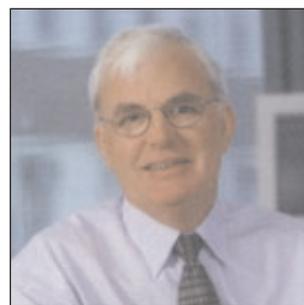
Ezio Rizzardo



Tamarapu Sridhar



Fiona Stanley



Robert Sutherland

## New Corresponding Members

Two overseas scientists have been elected Corresponding Members of the Academy. A Corresponding Member is a person who is eminent in respect of scientific discoveries and attainments, has made contributions to science in our region, but is not normally resident in Australia.

Professor Joseph Connell, from the University of California Santa Barbara, is a major international figure in ecology. His PhD research began the field of experimental marine ecology. More recently he has focused on biodiversity, particularly in Australian coral reefs and rainforests. He has made an enormous contribution to Australian science.

Professor Charles J Krebs is Emeritus Professor in the Zoology Department at the University of British Columbia in Vancouver. Professor Krebs's major contributions have been in the population dynamics of small mammals, especially of sub-Arctic Canada. He was Chief of CSIRO Wildlife Research between 1982 and 1984.



Charles J Krebs

## Biographers

Memoirs of deceased Fellows are published in *Historical Records of Australian Science*. The biographers for **Professor Samuel Carey** are Professor P G Quilty and Dr M Banks; biographers for **Professor Oliver Lancaster** are Professor Eugene Seneta and Professor K Eagleson; biographers for **Professor Geoffrey Opat** are Professor Tony Klein, Professor Bruce McKellar, Associate Professor J G W Wignall and Dr Ragbir Bhathal.

Information about *Historical Records of Australian Science* is available at [www.publish.csiro.au/journals/hras/](http://www.publish.csiro.au/journals/hras/).

## Sustainability symposium

There is some good news on the environmental front: whales are on the increase, introduced species are being better controlled, air quality is improving and the release of chlorofluorocarbons, which damage the ozone layer, has almost stopped. In other areas, human impacts have been realised and attempts are being made to reverse trends.

This was one of the messages of Dr Graeme Pearman, the Chief of CSIRO Atmospheric Research and convenor of the Academy's symposium, *Transition to sustainability*, held on 3 May 2002. However, he said, there is still a great deal to do in areas such as greenhouse gas emissions, and opportunities for those countries that act quickly.

The symposium, which was attended by Fellows, educators and members of the public, canvassed different views of sustainability and how it might come into being.

The Chief Executive of the Cooperative Research Centre for Freshwater Ecology in Canberra, Professor Peter Cullen, explored how knowledge needed to be managed to gain acceptance of scientific solutions to problems of sustainability.

An environmental economist with CSIRO Land and Water in Adelaide, Mr Mike Young, took an economic view of natural resources and suggested some policies to encourage sustainability.

The Commonwealth government's Chief Scientist, Dr Robin Batterham, spoke about the importance of science, technology and scientific literacy to define the trade-offs that will bring about sustainability.

At the end of the symposium, a blueprint for sustainability science was presented and aroused lively discussion. The symposium proceedings are available on the Academy's website at [www.science.org.au/proceedings](http://www.science.org.au/proceedings).

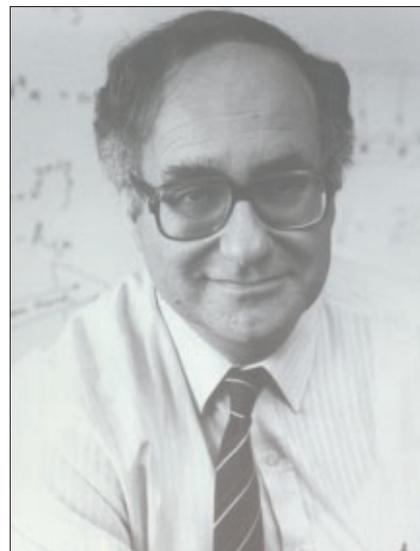
## Geoffrey Opat

Geoffrey Ivan Opat was born in Melbourne on 16 November 1935. He died on 7 March 2002.

He went to Brighton Grammar School and matriculated dux of the school in 1953. After that, he spent most of his career at the University of Melbourne. He studied physics and in 1961 gained a PhD for theoretical investigations into photonuclear reactions.

He won a Fulbright Fellowship and spent the next three years doing research in theoretical particle physics at the University of Pennsylvania. He returned to Melbourne as a senior lecturer in physics. He was instrumental in forming an experimental high-energy particle physics group which studied the physics of antiproton annihilation. He carried out experiments in the USA, Britain and Canada.

He became professor of experimental physics in 1973. After that much of his research was concerned with the foundations of physics. He developed wave optical techniques for reactor neutrons, and optical systems for the quantum waves of neutral atoms and molecules. He studied the effects of gravity, inertia and stress on the electrical properties of conducting



Geoffrey Opat in 1994

solids, and he has worked on the theoretical aspects of the physics of gravitation.

Professor Opat also worked on industrial projects: a new length transducer, the refining of aluminium, and a tool for measuring gravity gradients for the mining industry. He was active in physics education for undergraduates and secondary school students.

He was elected to the Fellowship of the Academy in 1994.

## Fellowship gets results

A conference held at the Royal Society in London in February 2002 was a direct result of the Academy's Graeme Caughley Travelling Fellowship.

In 1998 the Caughley Fellowship was awarded to Dr Jim Hone, a wildlife ecologist from the University of Canberra. As part of the Fellowship, Dr Hone visited scientists in the UK to learn about their research and its implications for wildlife research and management in Australia and New Zealand.

One of the scientists he visited was Professor R Sibly, from the University of Reading. After Dr Hone returned to Australia, he and Professor Sibly continued discussions on wildlife population dynamics and decided that a conference on the topic would be appropriate. They received financial

support and organised the conference.

The two-day meeting focused on population growth rate as the unifying variable linking the various facets of population ecology, including population regulation, density dependence, conservation biology, harvesting and ecotoxicology. Fourteen speakers from around the world presented papers. A theme to emerge from the meeting was the need to directly address the determinants of population growth rate, especially by identifying the effects of trophic factors, such as food, predators and parasites. Methods for doing so were described.

The proceedings will be published in September in the *Phil. Trans. Royal Society London*. Further details can be obtained from Dr Jim Hone, email [hone@aerg.canberra.edu.au](mailto:hone@aerg.canberra.edu.au).

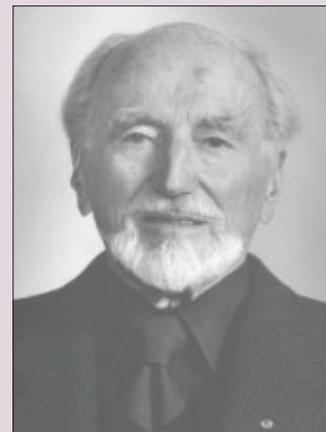
## Taiwan seeks collaborators



Joseph C H Yang, left, the Director-General of the Department of International Programs from Taiwan's National Science Council, and Yu-Hong Shan, also from the department, met the Academy's Foreign Secretary, Kurt Lambeck, on 3 April. Dr Yang gave details of Taiwan's increasing expenditure on research and development, and of its research priorities. He said that the National Science Council was keen to collaborate with Australian organisations on biotechnology for animal health, food biotechnology, particulate technologies and sustainable development.

## Nova birthday

The Academy celebrated five years of its website, Nova: science in the news, at the launch on 23 May of the topic, Bitumen battles – the phenomenon of road rage. Pictured, from left, are Amy Pryor, Neville Fletcher, Don Aitkin, Chair of the NRMA-ACT Road Safety Trust, and Maureen Swanage. The topic was sponsored by the NRMA-ACT Road Safety Trust. The principal sponsor of Nova is Telstra.



Phillip Law

## Law turns 90

Dr Phillip Law, turned 90 in April 2002. He is a former leader of Australian National Antarctic Research Expeditions and Director of Australia's Antarctic Division.

Law was a secondary school teacher in country Victoria before studying physics at the University of Melbourne. After World War II he went on an expedition to Macquarie Island and Antarctica, the first of 23 voyages to Antarctica and sub-Antarctic regions. He founded bases at Mawson, Davis and Casey and directed the mapping of about 2 million square kilometres of territory.

After his work in Antarctica he became executive vice-president of the Victoria Institute of Colleges, at a time of great change for technical colleges. He was elected a Fellow of the Academy in 1978.

The transcript of an interview with Dr Law is available on the Academy's website at [www.science.org.au/scientists/pl.htm](http://www.science.org.au/scientists/pl.htm).

## Photonic conference

The Academy and the Australian National University will host the first conference of the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series from 18 to 24 August 2002. The conference, *Photonic crystals down under*, will bring together researchers and students from Australia and overseas to promote emerging technologies. The conference series is funded by the Commonwealth Department of Education, Science and Training. More information is at [www.rsphysse.anu.edu.au/nonlinear/meeting](http://www.rsphysse.anu.edu.au/nonlinear/meeting).