

Science policy

As an independent body of Australia's leading research scientists, the Academy can bring together experts from universities, research agencies and institutes, industry and government to consider and report on scientific issues. The Academy has had an active year publicising science-related issues such as the use of gene technologies to produce genetically modified plants, response to climate change, water stewardship, sustainable ecosystems, and research and innovation priorities.

Overview

In September, the Academy released a policy statement that was launched at the National Press Club in an address by the Academy President, Professor Kurt Lambeck. The 2007 policy statement *Research and innovation in Australia* identified ten actions that Australia can take to maintain a strategic economic position in a world where many other nations have a competitive advantage. The recommendations aim to increase the chances of the nation realising its potential as a major contributor to a global, knowledge-based economy.

Once again, the Academy held a number of symposia. Each year as part of the Annual General Meeting in early May, a one-day symposium on a scientific issue of broad contemporary interest is held. The 2007 annual symposium was *Development and evolution of higher cognition in animals*. Speakers challenged ideas about animal behaviour as they discussed the ability of animals to learn complex tasks, make and use tools, and plan for the future: aspects of behaviour that were previously considered to be unique to humans.

In other events, the Academy held the sixth annual High Flyers Think Tank, *Extreme natural hazards*, in late October. This Think Tank was designed to bring together early- and mid-career researchers from a broad range of disciplines to:

- engage in thinking about novel applications of existing science and technology
- identify gaps in knowledge that might be addressed when applying science, including social science, and technology to a particular issue.

Held in an independent setting, the Think Tanks are seen by the Academy as a unique opportunity for career development and network creation – to be particularly encouraged among the nation's next generation of researchers and their institutions. Furthermore, it is well recognised that interdisciplinary and transdisciplinary approaches to problem-solving enable more diverse and lateral thinking and so achieve fuller outcomes.

Previous Think Tanks have culminated in reports to government that have been timely, well received and instrumental in influencing policy development. Past Think Tank topics include:

- *2006 Innovative technical solutions for water management in Australia*
- *2005 Biotechnology and the future of Australian agriculture*
- *2004 Emerging diseases – ready and waiting?*
- *2003 Safeguarding the nation*
- *2002 Australia's national research priorities*

Reports and submissions issued by the Academy are available at:

www.science.org.au/reports

Media releases are available at:
www.science.org.au/media

Think Tank proceedings are available at: www.science.org.au/events/thinktanks

Two Academy projects were funded under the Australian Research Council's Linkage Learned Academies Special Projects scheme. The first is a project on the hydrogen economy, and the second a project designed to enhance the quality of the experience of postdoctoral and early-career researchers.

Research and innovation in Australia: A policy statement

Academy President Professor Kurt Lambeck launched the 2007 policy document *Research and innovation in Australia: A policy statement* at his National Press Club address on 26 September. The document puts forward ten actions that Australia must take to maintain a strategic economic position in a world where many other nations have a competitive advantage.

The recommendations aim to increase the chances of the nation realising its potential as a major contributor to a global, knowledge-based economy. In a world where information is only a click away, the competitiveness of nations such as Australia will be tested increasingly by a new world order. The Academy contends that Australia's future socioeconomic and environmental prosperity will be underpinned by science, technology and innovation.

Without urgent attention to education, research and innovation policies, Australia may find its current advantages in the international market-place rapidly eroded. Alternatively, strategic investment in science, technology and innovation will open up new and exciting opportunities to strengthen the quality of life for all Australians. The policy statement is available at: www.science.org.au/reports/aas-policy-2007.pdf



The Academy's 2007 policy statement

Ten recommendations

1. That Australia increases its support for the national R&D effort to ensure that it retains an internationally competitive science capability to underpin the nation's industrial, commercial, environmental and economic position among leading world economies.
2. That Australia examines the implications of the continuing relatively low level of private sector investment in R&D and creates policy settings that encourage greater innovation.
3. That Australia further addresses the critical lack of suitably qualified science and mathematics teachers, and expands programs to encourage high school students to study science and mathematics.
4. That Australia maintains a long-term commitment to basic research funding in universities, and ensures that the Research Quality Framework (RQF) results in additional funds for high-quality research.
5. That Australia continues to invest in the future by building on the Higher Education Endowment Fund (HEEF) for capital works and research infrastructure in universities.
6. That Australia provides support for publicly-funded research organisations sufficient to maintain their core capabilities, on which their competitiveness as world-class research providers depends.
7. That Australia increases its level of support for existing research centre schemes and develops new 'International Research Centres', and that the research fellowship awards be substantially expanded, particularly for early- and mid-career researchers.

8. That Australia makes a long-term commitment to maintaining first class national research infrastructure facilities and promotes Australian access to international facilities.
9. That Australia gives urgent attention to nurturing rewarding and secure career paths for talented early-career researchers.
10. That Australia recognises the importance of engagement with the international scientific community and uses science more effectively as a tool in foreign policy.

High Flyers Think Tank on extreme natural hazards

Growing community awareness about climate change and a perceived increase in the frequency and severity of natural disasters prompted the Australian Academy of Science to investigate extreme natural hazards as the topic of a 2007 High Flyers Think Tank. The Academy was aware that international events such as the tsunami of 2004, Hurricane Katrina of 2005, outbreak of SARS, and bushfires in California appeared to have increased the public perception that more attention is required to ensure sufficient understanding, early warning, response and recovery from such catastrophic natural disasters.

Natural hazards were defined as geophysical, atmospheric or hydrological events – earthquake, landslide, tsunami, windstorm, wave or surge, flood or drought – that have the potential to cause harm or loss to human health and safety, the economy, the environment, or the fabric of society at large. Extreme natural hazards were seen to refer particularly to disastrous events, as distinct from less extreme natural hazards such as seasonal bushfires which occur more frequently. In Australia, these less disastrous types of events usually have well established response and recovery practices as compared with extreme hazards.

The Think Tank was held in Melbourne at the invitation of the chair of the Regional Group of Victorian Fellows, Professor Tony Klein. It was opened by Academy President, Professor Kurt Lambeck and the keynote address was given by Mr Michael Tarrant of Emergency Management Australia who outlined the evolution of Australian emergency management theory and post-war practice with some examples from Australia and overseas.

After hearing presentations from other invited speakers, 65 Think Tank participants divided into four breakout groups to identify trends in extreme natural hazards as they relate to the framework of PPRR – prevention, preparedness, response, and recovery. Participants discussed scientific, social and technological options for investigation and implementation to deal better with extreme natural hazards in Australia. A number of possibilities and recommendations were identified and participants noted that most of the options would need to be implemented in close consultation with the community.

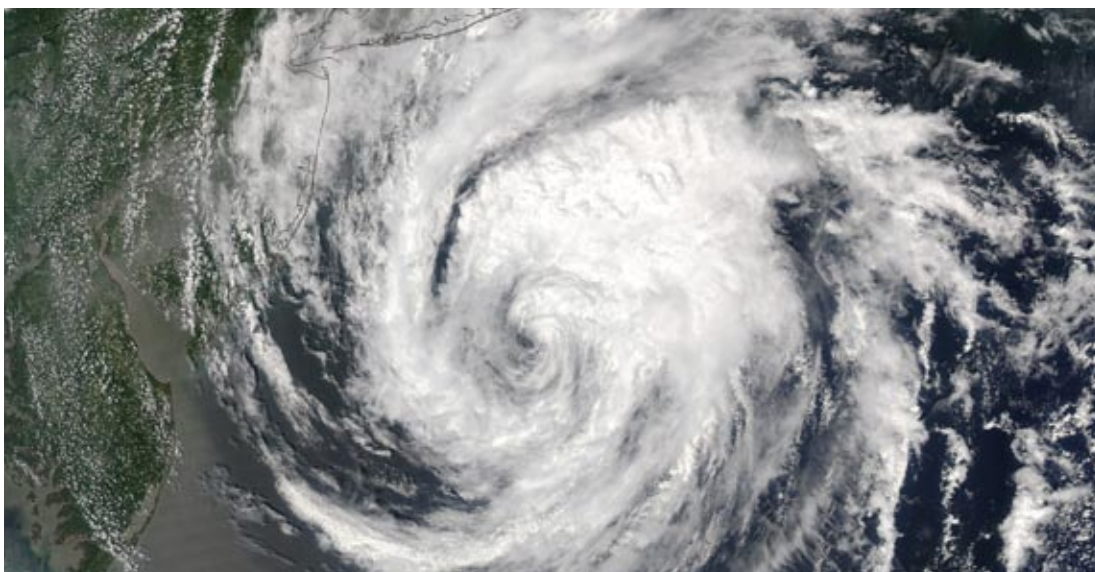


Photo: NASA Earth Observatory

Cyclone Beryl: An extreme natural hazard

The Think Tank participants concluded that to improve the national preparedness and response for extreme natural disasters, Australia should consider the need to:

- scope the capacity – that is, determine whether Australia as a nation can budget for the long-term and short-term recovery of a community from a disaster
- explicitly include extreme events and natural disasters when considering research priorities
- allow a greater shift from single hazard assessments to multi-hazard approaches
- ensure better interdisciplinary, interregional, and intergovernmental cooperation in order to obtain multidimensional views
- undertake more research on how natural systems actually recover from extreme events
- consider the role of diversification as a response, to spread risk and build resilience
- better recognise the importance of the long-term perspective
- ensure better integration of vulnerability assessments.

Further information and proceedings are available at: www.science.org.au/events/thinktank2007

Science at the Shine Dome symposium – *Development and evolution of higher cognition in animals*

At this year's annual symposium *Development and evolution of higher cognition in animals* held in May, Sir Patrick Bateson, FRS, Professor of Ethology at Cambridge University – known for his interest in the ethics of using animals in research and hunting red deer with hounds in England – presented the Rutherford Lecture. In his plenary address he used examples from birds, rodents, chimps and invertebrates to show how the adaptability of an animal can drive the evolution of behaviour.

Other expert speakers at the symposium showed how animals may be much more consciously aware than previously thought. Professor Mandyam Srinivasan FAA from the University of Queensland outlined how honeybees use prior knowledge as they learn to detect poorly visible or camouflaged objects and how they are capable of associative recall triggered by familiar scents. Professor Giorgio Vallortigara from the University of Trieste in Italy showcased predispositions and core knowledge in chickens and Professor Russell Gray from the University of Auckland demonstrated how New Caledonian crows show remarkable tool manufacturing skills with fine honing and cumulative crafting in their design. This cutting-edge research has immediate ramifications for ethics and strategies for sensitively managing animal welfare. Transcripts from the symposium are available from: www.science.org.au/sats2007/symposium

A paper has since been published by these authors which highlights some of their findings: Vallortigara G, Snyder A, Kaplan G, Bateson PPG, Clayton NS and Rogers LJ (2008). *Are animals autistic savants?* Public Library of Science, 6(2), e42. The January/February 2008 issue of *Australasian Science* also contained three articles from the speakers on the theme of intelligence.



Rutherford lecturer: Professor Sir Patrick Bateson

Photo: © Irene Dowdy

RQF journal ranking exercise

At the request of the then Department of Education, Science and Training, the National Academies Forum coordinated much of the draft ranking of research outlets for any forthcoming Research Quality Framework (RQF) process. The Academy of Science and the Academy of Technological Sciences and Engineering (ATSE) coordinated rankings of science and engineering journals within the RFCD (Research Fields, Courses and Disciplines) divisions as provided by the Australian Bureau of Statistics. Wherever possible, journal lists were constructed at the four-digit RFCD code level.

For the majority of science disciplines, the Academy relied on its discipline-specific National Committees to advise on journal rankings. The main determinant of the ranking was the quality of the articles that each research outlet contains, rather than the publication quantity. Journals were assigned one of four prestige bands – A1, A, B or C – depending on their assessed current quality.

Only those journals containing the highest quality papers from the world's leading researchers, the top 5 per cent of journals, were rated as A1. Journals ranked A belong to the next 15 per cent, and represent those journals also publishing very high quality papers with a significant proportion coming from the world's leading researchers. This group includes the leading journals in a number of sub-disciplines. The next 30 per cent of journals were rated B, and the final 50 per cent of peer reviewed journals were rated C.

The Academy was swamped with responses and interest in the RQF journal ranking exercise. It is presently unclear how the journal rankings will be used in the assessment of quality outputs by research groups.

Sir Mark Oliphant Conferences

Expressions of interest in the Sir Mark Oliphant Conferences: International Frontiers of Science and Technology series funded by the Department of Industry, Innovation, Science and Research under the International Science Linkages – Science Academies Programme were sought in May 2007. The Academy received 32 applications: from this pool, a number of applicants were selected for the short list and two applicants were successful. One successful application was for a conference entitled *Old forests, new management: Conservation and use of old-growth forests in the 21st century* by the University of Tasmania. This event was overseen by ATSE and held on 17 to 21 February 2008. The other successful application was from The Bionic Ear Institute on the theme of *Medical bionics – a new paradigm for human health*. The Australian Academy of Science is responsible for overseeing the management of this conference which is scheduled for 16 to 19 November 2008.

Another call for applications under the Sir Mark Oliphant Conference scheme was released for the 2008–09 financial year and closed on 18 February 2008. Further information on the scheme is available from: www.oliphant.org.au A new logo for the conference series has since been developed and the website has been revamped to convey a more contemporary image. The website is at: www.oliphant.org.au

Development of an Australian scientific roadmap for the hydrogen economy

The Academy's report on *Development of an Australian scientific roadmap for the hydrogen economy* was released in March. It examines Australia's contribution to research into hydrogen as a future energy carrier and use in fuel cells through a bibliometric analysis of the published research literature. It was funded by an Australian Research Council Learned Academies Special Projects grant. The heightened interest in hydrogen is because of its potential use in fuel cells for electric power generation in motor vehicles and other applications with zero emissions of carbon greenhouse gases. However, there are a number of significant research challenges to be addressed before there is widespread use of hydrogen fuel cells.

The report notes that the Australian Research Council has already announced funding for hydrogen energy research in 2001–07 of over \$22 million for the period 2002–11. In this fast moving field, Australia is a minor contributor as the 16th largest producer of hydrogen energy publications with 1.78 per cent of the world's hydrogen publications in 1998–2006. This is lower than for science as a whole, for which Australia produced 2.89 per cent of the world's science publications in 2004. However, the report does identify a number of key areas in which Australian research can make significant contributions, such as hydrogen storage materials, carbon capture and storage, and solar-thermal reforming of natural gas, and the report makes a number of recommendations for increased government support for hydrogen energy research and coordination.

The report follows on from the Academy's annual symposium on *Science on the way to the hydrogen economy*, which was held on 5 May 2006. It was convened by Professor Michael Barber FAA, as part of the Academy's annual *Science at the Shine Dome* event.

Dr John Wright, Director of the CSIRO *Energy Transformed Flagship Program* set the scene for the symposium with a brief history of hydrogen and a description of one possible future scenario. The distinguished keynote speaker, Dr George Crabtree, Senior Scientist at the Argonne National Laboratory, USA, spoke of the research challenges for creating a mature hydrogen economy. Other researchers from the CSIRO and Australian universities outlined their research in relation to global research priorities for hydrogen as a future energy carrier. The symposium proceedings are available at: www.science.org.au/sats2006/symposium

Early-career researchers workshop

The Academy held a workshop, *Enhancing the quality of the experience of postdocs and early-career researchers*, from 14 to 15 February 2008 with support from the Australian Research Council (ARC) under the Learned Academies Special Projects scheme. About 60 researchers came together from many different disciplines to discuss this timely topic. Minister Kim Carr opened the event following a welcome from the President of the Academy, Professor Kurt Lambeck. The dinner speaker was Professor Margaret Sheil, Chief Executive Officer (CEO) of the ARC and another keynote speaker was Professor Warwick Anderson, CEO of the National Health and Medical Research Council. A series of expert presentations were delivered by some of the Academy's most eminent members, Australia's best scientists, and science communicators. Topics ranged from mentoring to writing great grant proposals, networking and international collaborations, addressing specialised audiences, dealing with the media, setting up scientific teams, recruitment, negotiation skills, project management and administration. There were regular breakout groups for discussion between sessions, and participants were



Minister Kim Carr speaking at the early-career researchers workshop

also asked to address two questions: what program is needed to provide mentoring and necessary skills to early career researchers in Australia, and how best can early career researchers engage with the Australian Academy of Science? Further information about the workshop is available from:
www.science.org.au/events/14-15february08

National Elevation Data Framework – DEM project

ANZLIC, the Spatial Information Council – with the support of the Department of Climate Change, Geoscience Australia and the Cooperative Research Centre for Spatial Information – is sponsoring the development of a National Elevation Data Framework, to produce a digital representation of the landform and seabed of Australia.

The Australian Academy of Science and the Australian Academy of Technological Sciences and Engineering have been engaged to undertake an independent review of the science case and, in the process, review the business plan and the analysis of user needs. The Academies will receive comments, and publicise the documents and comments to support the National Elevation Data Framework. To accomplish these aims, a public workshop was held on 18 March 2008.

Once the framework has been endorsed by the Academies, it is expected that it will be accepted by the relevant science, spatial, user, vendor, and funding provider communities. This should lead to the endorsed documents being used to produce an implementation plan, and the acceptance of the plan by the relevant bodies, resulting in appropriate funding and implementation.

Australian Department of Climate Change activities

The National Committee for Earth System Science co-sponsored with the Department of Climate Change a workshop entitled *Vegetation dynamics and climate change* at the Shine Dome on 14 and 15 August 2007. The workshop was held to prioritise research on processes that influence the nature and distribution of plant communities in response to climate change. The proceedings can be found at:
www.globalcarbonproject.org/meetings/VegetationDynamics.htm

Australian Frontiers of Science

The third Australian Frontiers of Science symposium was held at the Shine Dome on 21 and 22 February 2008. The event was a successful opportunity for some of Australia's most outstanding younger scientists to showcase their research to peers and Academy Fellows.

The symposium's aim – to widen the focus of early-career researchers by cross-disciplinary discussion – was achieved through eight sessions introducing diverse fields of research. Symposium attendees were immersed in the forefront of various fields of science, from touring through the molecular structure of cells and treading over past environments of the Earth, to discovering the furthest reaches of the universe through new technologies.

Each session was brought together by a prize-winning younger scientist, who formed the symposium Organising Committee to decide on the topics, chairs and other speakers to be involved. Audience members were selected young researchers from throughout Australia, who contributed to the intense discussion and the new ideas that emerged from a meeting in which some of Australia's brightest young minds came together. Australian Frontiers of Science symposium proceedings will be available at:
www.science.org.au/events/frontiers.htm