

Science policy

The objectives of the Academy are to promote science through a range of activities, with one of its major areas of interest being the contribution of advice to assist the formulation of evidence-based policy directed at national needs and to inform international debate. The Academy brings together top Australian scientists, all of whom are seen as world figures in their fields. This provides the capability to access expertise over many scientific areas and issues.

Overview

This year has been a particularly active one for the Academy in responding to the Australian Government's initiation of a series of reviews relating to a range of science, technology and innovation issues, as well as research training and infrastructure requirements. In addition to preparing submissions to eight of these reviews, and responses to three of those that have reported, the Academy also provided input to two consultations by the Australian Research Council, and provided submissions to and/or appeared before five related parliamentary inquiries.

As part of the Academy's Annual General Meeting in early May each year, a one-day symposium on a scientific issue of broad contemporary interest is held. The 2008 annual symposium *Dangerous climate change: Is it inevitable?* brought together some of Australia's leading climate change scientists to consider what we know about climate change (the climate system, the impacts and the mitigation options) and what we still have to learn. Key conclusions were the need to develop and apply new knowledge, both within and between disciplines, while simultaneously building resilience in the face of uncertainty by managing risk through the application of the best available expert knowledge.

The seventh annual High Flyers Think Tank was held at the University of Sydney in early November, supported for the first time by the Theo Murphy (Australia) Fund which is administered by the UK Royal Society. These events provide a unique opportunity for career development and network creation for early- and mid-career researchers. They bring together participants from a broad range of disciplines to think about novel applications of existing science and technology; and to identify gaps in knowledge that might be addressed when applying science, including social science, and technology to a particular issue.

The topics are selected to culminate in reports to government that are relevant, timely and instrumental in influencing policy development. The 2008 Think Tank topic, *Preventative health: Science and technology in the prevention and early detection of disease* was selected in response to concerns in Australia and in many other countries about significant increases in illnesses such as cancer, metabolic syndrome (including diabetes and heart disease), mental health (particularly anxiety and depression), and infectious diseases.

The Academy also began the project *Nanotechnology: Ensuring the benefits and managing the risks* and is participating in an inter-academy project, under the auspices of the National Academies Forum (NAF), on *Understanding the formation of attitudes to nuclear power in Australia*. Both projects are funded under the Australian Research Council's Linkage Learned Academies Special Projects program.

In addition the Academy, in conjunction with the Australian Academy of Technological Sciences and Engineering, commenced a joint study of Australian needs for Earth observation from space over the next 10 to 15 years to complement the plan on space science being developed by the National Committee for Space Science.

Submissions by the Academy to government reviews and inquiries

The Academy's submissions, inputs and responses to a diverse range of science policy issues being considered by government are listed below. In a number of instances national committees provided significant contributions.

While most studies are still underway, three major reviews – the National Innovation System Review by Dr Terry Cutler, the Review of the Higher Education System by Professor Denise Bradley and the Climate Change Review by Professor Ross Garnaut – have reported. However, the world has changed so much since their initiation as a result of the global financial crisis that the government has deferred specific responses until at least the Budget process in May, and funding allocations that are made seem likely to be provided over longer periods.

24 April	Submission to review of Questacon – the National Science and Technology Centre
30 April	Submission to the National Innovation System (Cutler) Review
14 May	Response to the Budget 2008–09
14 May	Submission to Review of the National Collaborative Research Infrastructure Strategy (NCRIS) Roadmap
30 May	Submission to House Standing Committee on Industry, Science and Innovation <i>Inquiry into research training and research workforce issues in Australian universities</i>
27 June	Submission to the Australian Research Council Future Fellowships consultation
30 June	Submission to the Australian Research Council on Excellence in Research for Australia Initiative consultation
18 July	National committee submissions on the NCRIS exposure draft of the 2008 Roadmap for Australian Research Infrastructure
31 July	Submission to (Bradley) Review of the Australian Higher Education System
7 August	Submission to Senate Education, Employment and Workplace Relations Committee <i>Inquiry into Academic Freedom</i>
31 August	Response to Cooperative Research Centre (O’Kane) review
30 September	Response to National Innovation System (Cutler) Review <i>Venturous Australia: Building strength in innovation</i>
1 October	Submission on Department of Defence discussion paper <i>Key questions for defence in the 21st century</i>
15 October	Submission to Infrastructure Australia discussion paper <i>Australia’s future infrastructure requirements</i>
28 November	Response to the Garnaut Climate Change Review statement on <i>Priorities for Australian climate change science research</i>
15 December	Submission to Australian Broadcasting Corporation (ABC) and Special Broadcasting Service (SBS) review
20 March	House Standing Committee on Primary Industries and Resources <i>Inquiry into the role of government in assisting Australian farmers adapt to climate change</i>

Appearances before committees of government inquiries

18 June	House Standing Committee on Industry, Science and Innovation Reference: <i>Research training and workforce issues in Australian universities</i> Professor Philip Kuchel FAA, Professor Kurt Lambeck FAA, Dr Sue Meek
12 September	Joint Standing Committee on Foreign Affairs, Defence and Trade Subcommittee Reference: <i>Australia's relationship with ASEAN</i> Professor Michael Dopita FAA, Dr Sue Meek, Ms Nancy Pritchard
16 October	House Standing Committee on Education and Training Reference: <i>Department of Education, Science and Training annual report 2006–07</i> Professor Peter Hall FAA, Professor Philip Kuchel FAA, Professor Kurt Lambeck FAA, Dr Sue Meek, Ms Shelley Peers

Submissions and statements made by the Academy are available at www.science.org.au/reports. Hansard transcripts of public hearings are made available on the internet when authorised by the committee. The web address is www.aph.gov.au/hansard. To search the parliamentary database, go to <http://parlinfoweb.aph.gov.au>.

The much anticipated review of the National Innovation System by Dr Terry Cutler was released as a green paper in September, along with a related review of the Cooperative Research Centre Program by Professor Mary O'Kane. The Academy responded to both these reports, agreeing with the principal conclusions and emphasising that it is Australia's continuing excellence in science and technology that will underpin our ability to innovate successfully and competitively in the long term and on the international stage.

This was a central theme of the Academy's contribution to the substantial and substantive Review of Higher Education by Professor Denise Bradley. It also underpinned the input to the review of the National Collaborative Research Infrastructure Roadmap, the Defence white paper *Key questions for defence in the 21st century*, and to Infrastructure Australia's *Australia's future infrastructure requirements*. In the last case, particular emphasis was placed on the need to carefully consider renewable energy technologies and their ability to contribute to the development of a low carbon economy.

Public understanding of science and technology and the capacity to engage in meaningful discussion about their application are also central to the creation of an innovative economy. The Academy's submissions to reviews of the National Science and Technology Centre, Questacon, the Australian Broadcasting Corporation and the Special Broadcasting Service recognised the important role of these organisations in enhancing community awareness and stimulating debate.

The Academy raised a number of concerns about the sustainability of Australia's research community in submissions and appearances before House of Representatives standing committee inquiries on research training and workforce issues and the Department of Education, Science and Training 2006–07 annual report. Key points were the need to provide improved career pathways for early- to mid-career researchers and to retain women scientists. Similar feedback was also contained in the Academy's submission to the Higher Education Review and the Australian Research Council (ARC) consultation on the Future Fellowships Scheme. The response to the ARC's consultation on the Excellence in Research Assessment Initiative included the importance of ensuring that multidisciplinary research would not be impeded.

One of the most active areas of input to science policy development had been in relation to climate change science. A number of Fellows and national committee members have been amongst the hundreds of scientists on the Intergovernmental Panel on Climate Change (IPCC) and its working groups. The work of this group was recognised by the joint award, along with former US Vice-President Al Gore, of the 2007 Nobel Peace Prize 'for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change.'

Through these international connections the Academy is aware that the IPCC's initial predictions regarding the impact of greenhouse gas emissions on the global temperature of the atmosphere have been largely confirmed. The consequences of rising temperatures are well understood in general terms and include changes in rainfall

pattern, greater variability in extreme meteorological events, sea level change and ocean acidification. However, the Academy has endeavoured to emphasise in a number of forums, including the Garnaut *Climate Change Review* and the House *Inquiry into the role of government in assisting Australian farmers adapt to climate change*, that these consequences remain difficult to quantify due to complex feedback mechanisms that are still not fully understood. Hence there remains considerable uncertainty as to how global change will be manifested at regional and smaller scales.

The Academy has issued a statement *Priorities for Australian climate change science research* that identifies a range of requirements for making systematic observations, together with basic and applied research, to reduce the uncertainties in our understanding of climate change processes, particularly on how global changes impact on local conditions. They include:

- greatly enhanced climate observing capability across the region, including surface measurements and synoptic remote sensing observations across the region;
- significant strengthening of Australian capabilities in theoretical analysis and modelling of the climate system;
- an independent predictive climate modelling capability that is appropriate for Australian conditions and whose outcomes are accessible to and well understood by the Australian research and user community;
- improved supercomputing facilities;
- training for the next generation of climate scientists; and
- effective linkages with the international programs.

The statement also supports calls for the establishment of an 'Australian Climate Change Research Institute' – with real and virtual elements – that builds on Australia's research talent. It would have its own core facility with the resources to fund collaboration between the universities, CSIRO and the Bureau of Meteorology, as well as international linkages to develop an integrated national program.

Science at the Shine Dome symposium – Dangerous climate change: is it inevitable?

The symposium convener, Professor Michael Dopita FAA, and his organising committee prepared a very interesting and most timely symposium program on the important topic *Dangerous climate change: Is it inevitable?* The keynote address, *The Arctic: Is dangerous climate change upon us?*, was presented by Dr Neil Hamilton. He went on to present a very grave picture of the situation in the Arctic and argued that the Arctic is the key to the global climate system because what happens in the Arctic is a magnification of what happens in the rest of the world. He reported that feedback occurring in the melting of the sea ice in the Arctic is accelerating the rate of sea ice loss. Ice that is five years old or more was classified as 'old sea ice'. Due to huge increases in melting in recent times, most of the Arctic spring cover this year is one year ice, which is thin and melts much more rapidly than old ice. As sea ice declines, krill, fish, seals and polar bears decline. In 2007, for the first time, there was no ice in the Beaufort Sea, the north coast of Russia, and the Northwest Passage.

Other speakers at the morning session were: Dr Michael Raupach FAA from CSIRO Marine and Atmospheric Research describing the carbon cycle; Dr John Church, also from CSIRO Marine and Atmospheric Research, discussing global sea levels; Professor Neville Nicholls of Monash University speaking about water, drying and climate change; and Professor Ove Hoegh-Guldberg from the University of Queensland talking about coral reefs and their ability to adapt to stress.

The afternoon session began with Professor Will Steffen from the Fenner School of Environment and Society discussing the human-nature relationship and a new geological epoch, the Anthropocene. This was followed by Professor Amanda Lynch from Monash University speaking on the vulnerability of socio-ecological systems

to a changing climate; Mr Roger Beale from The Allen Consulting Group presenting the challenges Australia faces from changing climate; and Mr Blair Comley from the Australian Government Department of Climate Change detailing the economic perspectives of climate change. Professor Graeme Pearman FAA gave the final address in which he asked the question 'Can we avoid dangerous climate change?' He summed up the day's proceedings by saying that avoiding dangerous climate change depended on our urgency in responding. It was also dependent on how we manage our social systems, balance our markets and intervention, and integrate multiple outcomes and multiple timescales. Deciding where we wanted to be and building in resilience were also key factors.

The proceedings from the symposium are available from www.science.org.au/sats2008/symposium.



Photo: © Irene Dowdy

Speakers and chairs from the annual symposium on dangerous climate change

High Flyers Think Tank on preventative health

The first High Flyers Think Tank to be supported by the Theo Murphy (Australia) Fund entitled *Preventative health: Science and technology in the prevention and early detection of disease* was held at the University of Sydney on 6 November. Some of Australia's and a few of New Zealand's brightest early- and mid-career researchers met to engage in vigorous discussion on a topic of national importance. With around 90 participants, this High Flyers Think Tank was the largest gathering since the Think Tanks began in 2002.

Academy President Professor Kurt Lambeck encouraged participants to identify 'new approaches that can be brought to bear on the problem under consideration...to apply [their] rich diversity of knowledge and experience to think about novel applications of existing sciences and technology and to identify gaps in knowledge that is required to tackle the problem'. He noted that there are many diseases, injuries and illnesses that can be prevented by analysis of risk factors, early detection, lifestyle changes and other measures.

Government efforts to improve Australia's health outcomes include a range of initiatives, one of which is the National Preventative Health Taskforce set up in April 2008 to provide evidence-based advice to government on preventative health programs. Their initial focus is to develop strategies for obesity, tobacco and alcohol related disorders by June 2009.

Professor Paul Zimmet, who is on the Taskforce's obesity working group, provided an overview of the work of the Taskforce. He spoke of the 'diabesity' epidemic in Australia, noting an almost 300 per cent increase in obesity prevalence and a similar increase in diabetes in a twenty year period between the early 1980s and 2000s.

After a stimulating presentation from Professor Chris Goodnow FAA, on the topic of genes and the environment, four other expert speakers spoke on their specialist health areas: Professor Bruce Armstrong on the process of carcinogenesis; Professor Ian Hickie on mental health and the dominance of neurological and psychiatric disorders in disability; Professor Kerin O’Dea on the metabolic syndrome in the context of metabolically healthy obesity and the role of diet and lifestyle, concentrating on social disadvantage and using the indigenous Australians as a small case study; and Professor Graham Brown on some of the threats in infectious diseases, including emerging infectious diseases and what we have learned from the past, mistakes made and where technology could possibly help us to do better in the future.



Photo: Joe Hlubucek

Think Tank on preventative health in progress

Participants then divided into four breakout groups (cancer, mental health, metabolic syndrome and infectious diseases) for detailed discussions on potential applications of science in disease prevention, such as the use of bioinformatics, diagnostic screening and vaccination. Summarising the discussions following a reporting back session, Professor John Chalmers noted the commonality of risk factors across the different diseases, the need for better data linkages (for example electronic support systems and bioinformatics) and the importance of better facilitation of cross disciplinary research. These needs are also common to other diseases that have been identified as national health priorities. Some of the key recommendations to address the needs identified were:

- Undertake a national health survey every five years to enable disease and risk factor trends to be analysed and monitored.
- Following the Preventative Health Taskforce’s phase 1 report in June 2009 – which will focus on obesity, tobacco and alcohol – other areas which might be adopted for its next phase include child health, mental health and infectious disease.
- While acknowledging potential barriers such as complex IT infrastructures and privacy considerations, hospital and institutional databases should increasingly be linked and data sets integrated, to assist researchers in identifying health risks.
- Establish a national biological repository of tissue samples with prior consent of patients to enable future research applications.
- Improve linkages between funding bodies – such as the ARC and the NHMRC – to facilitate the integration of human health and relevant animal studies.

- Reduce excessive reporting and compliance requirements and multiple ethical clearances which together act as significant barriers to research.

Further information and proceedings from this and previous Think Tanks are available from www.science.org.au/events/thinktank2008.

Australian Research Council Linkage Learned Academies Special Projects

The Australian Research Council's Linkage Learned Academies Special Projects fund the learned academies to undertake projects which:

- capitalise on their unique capabilities;
- assist programs of research undertaken by institutions; and
- may be expected to have results of broad benefit for research and scholarship in the natural and applied sciences, technological development and applied technology, the social sciences and the humanities.

Australia's learned academies were awarded \$561,272 over two years for research into issues as diverse as decisions about nuclear energy, nanotechnology safety, multiculturalism, workforce needs, and new approaches to illness and wellness, under the scheme.

Applications are accepted from individual learned academies and from the National Academies Forum (NAF). NAF was established in 1995 to help overcome the difficulties that have often separated science, technology and engineering from the social sciences and the humanities. It provides a basis for cooperative activities by the four academies and a common point of access to the academies for outside organisations and individuals. In this way it can link about 2000 of Australia's most distinguished scholars across the full range of academic disciplines to inform policy makers. NAF is also committed to bringing debate to wider audiences and these activities are highlighted on page 91.

The Academy project will examine nanotechnology research trends and priorities in Australia and consider appropriate criteria for assessing the health, safety and environmental risks on a case-by-case basis for different applications.

The NAF project, *Understanding the formation of attitudes to nuclear power in Australia*, aims to use nuclear energy as a case study to bring to bear the multidisciplinary perspectives of the four academies to increase understanding of what influences various interest groups, and the community at large, in formulating their opinions on contentious issues. The study is being managed by ATSE, an expert reference group has been established with representatives from each academy, and a project director has been appointed.

National Strategy Plan for Earth Observation from Space

The Academy and ATSE have a long-standing commitment to a strong Australian role in space science, including the various aspects of space-based Earth observation. The Academy's National Committee for Space Science has been working for some time on a Decadal Plan for Space Science and, with support from a number of Australian government departments and agencies with responsibilities for various aspects of Earth observation from space, the two academies agreed in December to undertake a complementary joint study of Australian needs for Earth observation from space over the next 10 to 15 years and to prepare a National Strategic Plan for Earth Observation from Space. A working group has been established which is supported by a steering committee made up of senior representatives of the academies and the main supporting organisations. The plan is expected to be finalised at the end of July 2009.