



Flying high: ideas flow at Think Tank



Photo: Newspix/Darren Sailer

Stepping into a drier future? The mighty Darling River near Mildura

The latest High Flyers Think Tank—on innovative technical solutions for water management in Australia—has come at a time of great need, with the nation in the grip of the worst drought on record.

Towns and cities are running out of water, crops are failing and the rivers are drying up. Our largest river system, the Murray-Darling Basin, has recorded its lowest-ever October inflow of 77 gigalitres (GL), compared with the average 1100 GL.

The 2006 Think Tank aimed to identify ethical solutions to water issues in Australia by exploring advances in technological, sociological and environmental areas.

A key ingredient of the gathering was the significant contribution made by early- and mid-career researchers, highlighted by the fact that the keynote speaker was young Californian scientist Dr Jason Holt.

The event was held at the University of Adelaide on 30 October at the invitation of the South Australian Fellows and their Chair, Professor Bob Vincent FAA.

Academy President Professor Kurt Lambeck welcomed participants by stressing that previous Think Tanks had been instrumental in influencing policy development and that with the water crisis, this had never been more important.

South Australia's Chief Scientist Emeritus Professor Max Brennan FAA said in his opening address: 'Water is now front-page news in Australia. Every day some aspect of the challenges facing us concerning the availability and use of water is covered in newspaper articles, television and radio.'

'The item that had the greatest impact on me was the picture of a young girl in Wentworth, New South Wales, jumping across a half-metre-wide Darling River, just 50 kilometres from where the Darling feeds into the Murray River. It's an extraordinary photograph.'

Keynote speaker Dr Holt, a research scientist from the Lawrence Livermore National Laboratories in California, provided a glimmer of hope when he presented cutting-edge research that could make desalination a viable solution for Australia's water shortage.

His laboratory has developed permeable nanotube membranes that could reduce the energy costs of desalination by up to 75 per cent compared with conventional membranes being used now. By dramatically reducing the economics and energy costs of desalination, a safe, reliable and cheap source of water may be lapping along our shores.

A transcript of Dr Holt's presentation is available at: www.science.org.au/events/26october06.htm

Talented groups of early- to mid-career researchers from decision support sciences, information technology, social sciences and plant and soil sciences brainstormed ideas relating novel applications of existing science and technology to water management in Australia.

The event recognised that policymakers essentially have two generic tools at their disposal: changes in the price charged for water and restrictions on how water can be used.

But the main focus of the Think Tank was on a third available path that involves either increasing the available water resource or improving its management with new practices, science and technology.

Young researchers involved in the Think Tank included:

- Dr June Marks, a research Fellow at the Department of Sociology in Flinders University of South Australia who specialises in community experiences of water recycling and the development of trust
- Dr Michelle Bald from the Department of Water, Land and Biodiversity Conservation, Adelaide and e-Water Cooperative Research Centre, who works on water allocation planning with the Mount Lofty Ranges
- Dr Brett Bryan, a senior research scientist with CSIRO Land and Water, who has over 15 years experience in the analysis of spatial information
- Dr Marisa Collins, a Postdoctoral Fellow with CSIRO Plant Industry, who is researching grapevine irrigation and water relations

The Think Tank was highlighted on the ABC television program Stateline South Australia in a segment entitled: 'Should SA desalinate?' A transcript is available at:

www.abc.net.au/stateline/sa/content/2006/s1781813.htm

The Think Tank report is at: www.science.org.au/events/thinktank2006/report.pdf

Getting under their skin: Boden Conference

Hair and skin development, cutaneous stem cell biology, wound healing, genetic skin diseases, skin cancer and skin gene therapies were the main topics of discussion at the latest Boden Conference.

Held at the University of Queensland's Moreton Bay Research Station, North Stradbroke Island from 22–26 September the conference, on epithelial stem cells and cutaneous regeneration, attracted 65 delegates, including researchers from Germany, Italy, New Zealand, Singapore, the UK and the US.

The conference was co-sponsored by the Academy, the University of Queensland and the Peter MacCallum Cancer Institute and supported by several Australian and New Zealand research societies.

Feedback from delegates has been very positive and organisers Joseph Rothnagel and Pritinder Kaur already have been lobbied to run another meeting.



Hair today: Boden Conference delegates take a break

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Published by the Australian Academy of Science
GPO Box 783

Canberra ACT 2601

www.science.org.au

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ISSN 1031-9204

STOP PRESS

Awards winners

2008 Burnet Medal and Lecture:

Professor Richard Shine FAA,
University of Sydney

Craig Medal: Emeritus Professor Hans Freeman FAA, University of Sydney

Haddon Forrester King Medal:

Professor David Groves FAA,
University of Western Australia

Hannan Medal: Emeritus Professor Eugene Seneta FAA, University of Sydney

Jaeger Medal: Emeritus Professor Ian McDougall FAA, Australian National University

Lyle Medal: Professor Yuri Kivshar FAA, Australian National University

Dorothy Hill Award: Dr Leanne Armand, Centre d'Océanologie de Marseille, France

Fenner Medal: Dr Peter Dodds, CSIRO Plant Industry

Gottschalk Medal: Professor Jamie Rossjohn, Monash University

Le Fèvre Prize: Professor Thomas Maschmeyer, University of Sydney

Moran Medal: Professor Robin Hyndman, Monash University

Pawsey Medal: Professor Ben Eggleton, University of Sydney

Douglas and Lola Douglas

Scholarship: Dr Naor Haim Bar-Zeev, Alice Springs Hospital

For more information on the Academy's awards and research support:

www.science.org.au/awards

New Councillors

The following nominees will be declared elected at the 2007 AGM:

Secretary (Biological Sciences)

— Professor Graham Farquhar,

following a postal ballot

Ordinary Member (Physical Sciences)

— Professor Ron Ekers

Ordinary Member (Physical Sciences)

— Professor Paul Haddad

Ordinary Member (Physical Sciences)

— Professor Andrew Holmes

Ordinary Member (Biological Sciences)

— Professor Ross Crozier

Forthcoming events

- National Academies Forum symposium — *A celebration of the history, culture, science and technology of Recherche Bay*, CSIRO Marine and Atmospheric Research, Hobart, Tasmania, 26–28 February 2007: www.science.org.au/events/26february07.htm

- *Science at the Shine Dome* and AGM — The Shine Dome, 2–4 May 2007: www.science.org.au/sats2007/index.htm
- Annual symposium — *Development and evolution of higher cognition in animals*, The Shine Dome, 4 May 2007: www.science.org.au/sats2007/symposium.htm

Science world abuzz with insect robots

Australia's top science award, the Prime Minister's Prize for Science, has gone to Professor Mandyam Srinivasan FAA, a Federation Fellow at the Australian National University.

Srini is world-renowned for his research with bees, vision and artificial intelligence. His work has provided many insights into how honeybees see the world in three dimensions and how they navigate around obstacles and to distant food sources before returning home with pinpoint accuracy.

His research, which receives funding from NASA and the US Department of Defence, has enormous applications for flight navigation and is watched closely by robotics experts around the world.

The 2006 Prize was presented to Srini by Prime Minister John Howard at a ceremony held in the Great Hall, Parliament House on 16 October.

In congratulating Srini, Academy President Professor Kurt Lambeck said: 'He cracked the code of vision in the world of bees, demonstrating that the motion of the passing landscape provides the bee with a third



Main photo: Vikky Wilkes

Square peg in a round hole: lateral thinker Srini at work with his bees

dimension to vision. This is how bees regulate their flight and ensure a safe landing.'

Professor Lambeck praised Srini as an exceptionally talented inter-disciplinary scientist who has combined his expertise in maths with his training as an engineer, adding: 'I'm sure it is this background that led Srini to devise novel experiments that gave new insights into insect vision. His exceptional ability to think

laterally has enabled esoteric studies to be translated into applications of enormous importance.'

- Mandyam Srinivasan is a Fellow of the Australian Academy of Science and the Royal Society of London. He is head of the Biorobotics Vision Laboratory and Director of the Centre for Visual Sciences in the Research School of Biological Sciences at the Australian National University.

When the farm meets the bush



Photo: CSIRO Plant Industry, VRU

Tea and empathy: conference delegates, above, and the man himself, Professor Frank Fenner

A diversity of opinions on a common goal was the main feature of the 2006 Fenner Conference on the Environment in November.

Entitled 'Integrating agricultural and environmental imperatives for a profitable and sustainable future',

the conference brought together over 200 attendees including farmers and revegetation practitioners as well as many of Australia's leading experts in land management, agronomy, conservation, economics, science, policy and industry.

The conference discussed the latest land management research from farming and conservation perspectives and while the methods and often the language of these two groups differed, their overall aim of improving sustainability was closely aligned.

Subjects discussed included native revegetation on farms, more sustainable agronomic techniques, new scientific tools for conservation such as molecular biology and economic incentives for improving land use practices.

Outcomes from the conference will be useful for informing future research and policy directions on agricultural sustainability, particularly where a key focus is the need for farming and conservation to function well together.

A conference outcomes summary will be made available to governments and agencies involved in land management.

Abstracts from the conference are available online at:

www.pi.csiro.au/FennerConference/index.htm, as will be some of the conference presentations and any future papers arising from it.

On the move: the 2006 Selby Fellow

A busy schedule awaited Professor Godfrey Hewitt on his arrival in Melbourne in October to take up the 2006 Selby Fellowship.

The first visit for Professor Hewitt, Emeritus Professor of Biology, University of East Anglia, Norwich, England was to La Trobe University, where he talked to staff and students, hosted by Dr Mike Westerman and Dr Yvonne Parsons.

This was followed next day by a public lecture in the Turner Theatre, Melbourne University. A personal highlight took place the next day, when he had lunch with Fellowship benefactor Ben Selby.

Keeping up the pace, Professor Hewitt participated soon after in a day-long workshop attended by academics from Melbourne, La Trobe and Monash Universities.

He said: 'The relatively young and enthusiastic researchers presented a range of Australian phylogenetic and taxonomic work, some of which was novel and inventive.'

He was impressed by a weekend

visit to Healesville Sanctuary to view some Australian species, commenting that considerable effort had been put into making this extensive collection accessible to the public.

His next stop was Adelaide's Flinders University, where he attended the National Phylogeography Workshop, in which the arid region was discussed by established geneticists, geologists and palaeoclimatologists.

Professor Hewitt said: 'This was a very fruitful meeting; I learned a lot and the group produced some promising ideas for future research. This is particularly opportune in the light of Australia's current drought and future climate forecasts.'

Following another public lecture he went to Kangaroo Island on a three-day field trip. He commented: 'This was the location of some of Professor Michael White's pioneering research on chromosomal speciation and hybrid zones. Flinders's Dr Steve Cooper is now applying modern genetic methods to this system, which is already yielding some fascinating results.'

Professor Hewitt then flew to Canberra, where he gave a lecture at the School of Botany and Zoology at the Australian National University before returning to England.

Interest in his visit also prompted an interview published in *The Australian* newspaper on 8 November.

In his parting remarks he said: 'There is already some excellent work from Craig Moritz's group in Brisbane on the phylogeography of the wet tropics; and the network to study the arid zone is a good idea. This latter habitat is little studied in the US or Europe and its understanding would be of worldwide importance.'

'I would particularly mention the work of Dr Steve Cooper, who has discovered underground fauna in this region, and of Dr Michael Kearney, who has some innovative ideas on the evolution of sex through the zone. Likewise, Dr David Rowell has pioneered the phylogeography of the temperate mountain fauna of NSW, with exciting indications for locating climatic refugia.'

Public Lecture Series 2006–07

Bird-brained birds and jumping proteas?

Continent-jumping proteas and unfaithful birds were the latest subjects in the Academy's public lecture series 'The origin of species: the Australian connection'.

The latest and third lecture in the series saw Professor of Evolutionary Biology at the Australian National University Professor Andrew Cockburn FAA, entertain his audience with tales of infidelity and social deception among the much-loved superb fairy-wrens.

His lecture on 5 December, 'Why is Australia a cradle for the evolution of complex social systems in birds?', explored the evolution of social complexity in Australia's birds and asked the question: Have our feathered friends been unfairly condemned as bird-brained?

Principal Research Scientist at the Royal Botanic Gardens Sydney Dr Peter Weston presented the second lecture in the series with an international botanic journey, 'Drifting proteas or continents? Historical biogeography of the Proteaceae', on 3 October.

Using modern molecular dating techniques and historical material from Joseph Hooker and Charles Darwin, he



Proteas and Gondwana: an evolutionary journey

mapped the evolution of the Proteaceae and their relationship to the ancient super-continent, Gondwana.

Transcripts from the lectures and

information on forthcoming lectures are available at:

www.science.org.au/events/publiclectures/index.htm

Synchrotron science: the Lloyd Rees Lecture 2006



Main photo: State Government of Australia

Unlocking the future: the Australian Synchrotron, above, and on right, Dr Jose Varghese with Mrs Marion Rees

The potential for biological research using the new Australian Synchrotron was the subject of the Lloyd Rees Lecture for 2006, delivered by Dr Jose Varghese in Melbourne on 29 September.

Entitled 'Using synchrotron science as a probe for biological research', this was the eighth in the series of biennial lectures to commemorate the life and work of Dr Lloyd Rees FAA, foundation Chief of the CSIRO Division of Chemical Physics from 1958 to 1978. The Rees Lectures are given by scientists who have made distinguished contributions to chemical physics in Australia.

Dr Varghese began by recalling that there are only about 25,000 human genes but more than 10 million gene products, or proteins that constitute the living human. Given the enormous degree of complexity this introduced, he said, how can we ever hope to understand the process?

These gene products control the development, repair and replication processes of life, yet we know only heuristically and indirectly how this is done.

An atomic description of these gene products is required to enable a detailed understanding of how living organisms function so that they can

then be manipulated and modulated to overcome problems in human health including cancer, heart disease and neurodegenerative diseases like Alzheimer's, by designing new antibiotics, anti-virals and therapies.

It is the physics and chemistry of how molecules interact at an atomic level that govern the machinery of life, he said.

Dr Varghese went on to discuss how high-brilliance X-ray sources available at modern third-generation synchrotrons have enabled a rapid discovery path for understanding biology from a whole-body, through cellular down to a molecular level.

In particular, the area of macromolecular structure determination and its impact on our understanding about the architecture of living organisms at a molecular level have led to a revolution in biological discovery.

Structure-based drug design involves the *ab initio* design of new chemical entities from the chemical environment of the target area—for example, the design of Zanamavir (Relenza) from the active site of neuraminidase as a drug against all strains of influenza viruses.

Dr Varghese then moved on to the opportunities for biological

research that will be available by accessing the beamlines of the new Australian Synchrotron, in particular the two protein crystallography beamlines that will spearhead biological macromolecular structure determination.

He then described the multi-disciplinary Preventative Health Flagship, involving several groups from CSIRO and the University of Melbourne, to study Alzheimer's disease.

Following this was an outline of a new project in partnership with the ARC Centre of Excellence for Coherent X-Ray Science, in which it is proposed to conduct 'single-molecule' X-ray structure determination of membrane proteins using free electron X-ray lasers — due to come on line in the next five to 10 years in major establishments overseas.

- Dr Varghese is a Chief Research Scientist at the CSIRO Molecular and Health Technologies in Parkville. He graduated with a BSc (Hons) in physics from the University of Queensland and a PhD from the University of Western Australia. After postdoctoral work in the UK he returned to Australia in 1980 to take up a position in the CSIRO Division of Protein Chemistry.

National Committees report

National Committee for Plant and Animal Sciences

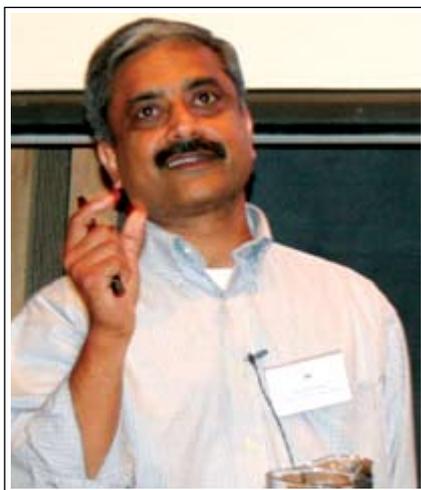
The Committee met twice in recent months. A meeting on 19 July at Ian Potter House was followed by a teleconference on 7 November. Discussion centred on the outcomes from the 2005–06 Australia-China grasslands workshops held in Canberra and Beijing. A discussion paper on production of a future map of Australia's biodiversity has been drafted and a Draft Academy Policy Statement on Gene Technology and Genetically Modified Plants has been prepared.

National Committee for Medicine

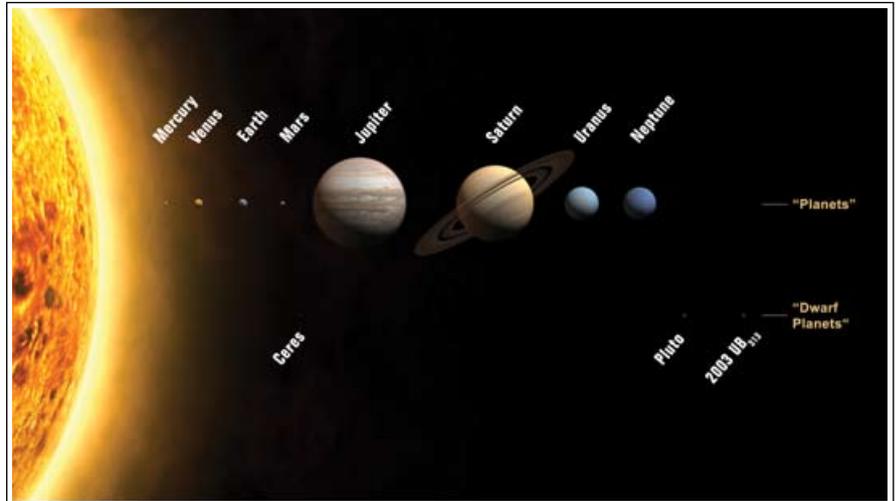
The Committee met in Canberra on 24 July. Discussion included research ethics, the impact of the 2006 Federal Budget on medical research and medicine and the InterAcademy Medical Panel's concern over the issue of rheumatic fever. Attending part of the meeting as invited guests to facilitate discussion on the issue of rheumatic fever in the Asia-Pacific region were Director of the Menzies School of Health Research, Darwin and President of the World Heart Federation Dr Jonathan Carapetis, Director-General of AusAID Bruce Davis and Principal Medical Adviser of AusAID Dr Jim Tulloch.

National Committee for Earth Systems Science

The Committee hosted the 'Science of seasonal climate prediction' workshop at The Shine Dome from 2–3 August. The two international speakers



Making a point: Dr Arun Kumar



Downsize for Pluto: the planets according to the new IAU definition

Image: Martin Kommissar

were Dr Arun Kumar, Climate Prediction Center, National Centers for Environmental Prediction, US National Oceanic and Atmospheric Administration and Dr Simon Mason, International Research Institute for Climate and Society, the Earth Institute of Columbia University, US. In addition to Academy support, the workshop was sponsored by the Bureau of Meteorology, CSIRO Wealth from Oceans Flagship, Bureau of Rural Sciences and Land and Water Australia. The report from the workshop, along with the program and abstracts, can be found at:

www.science.org.au/events/seasonal

National Committee for Mechanical Sciences

The Committee met by teleconference on 21 September. Discussion focussed on the need to raise the profile of the discipline, particularly among students, and the report from the International Union of Theoretical and Applied Mechanics General Assembly held in Rhode Island in August at which Australia was represented by Professor Ernie Tuck FAA and Dr Jim Denier. The next International Conference on Theoretical and Applied Mechanics, ICTAM2008, will be held in Adelaide.

National Committee for Earth Systems Science

The Committee's new Terrestrial Carbon Task Force met on 27 September, at Ian Potter House to

discuss the way forward in responding to the Blueprint for Australian Terrestrial Carbon Cycle Research. Twelve people attended this inaugural meeting and brainstormed ideas for responding to this important document.

National Committee for Chemistry

The Committee held its second meeting for the year, a teleconference on 27 September. The Committee will explore ways to persuade young chemists to attend International Union of Pure and Applied Chemistry (IUPAC) congresses. Further discussion centred on IUPAC delegations, committee nominations and other IUPAC activities such as the Young Chemists' Prizes and the Poster Prize scheme.

International Astronomical Union

The Union's (IAU) XXVIth General Assembly was held in Prague from 15–30 August. Media interest was considerable due to the adoption of resolutions that modified the definition of a planet and relegated Pluto to 'dwarf planet' status (see image above).

International Mathematical Union

At the Union's General Assembly in August, Corresponding Member Professor Terence Tao was presented with the Fields Medal for his outstanding achievements in mathematical sciences. This award also received media coverage in Australia.

International activities



Working together: the Argentinean delegation



The issue of energy: Professor Yongxiang Lu

Argentina

An Argentinean delegation led by Secretary for Science, Technology and Productive Innovation Tulio Del Bono visited the Academy on 31 August and met Professor John White FAA. The main aims of the visit were to expand cooperative activities under the Memorandum of Understanding on Science and Technology signed by Australia and Argentina in 2004 and establish relations with the main research institutions involved in biotechnology, agriculture, clean technologies and information society applied to agriculture.

Indonesia

The Australia-Indonesia Joint Symposium in Science and Technology was held in Jakarta from 13–15 September. Future strategies for Australia and Indonesia to identify opportunities for further research cooperation were discussed during the plenary sessions. The workshops investigated biotechnology and agriculture, focussing on the early diagnosis of diseases and on energy and water, specifically the centralisation and decentralisation of these commodities.

The aim of the symposium was to promote research cooperation between Australia and Indonesia and recommend courses of action arising from the symposium and related activities. The Australian delegation was co-led by Professor Leon Mann, Academy of Social Sciences in Australia and Professor John Mackenzie FAA, Australian Biosecurity CRC and Curtin University of Technology.

The meeting was conducted under the umbrella of the Australian Government Department of Education, Science and Training (DEST) and RISTEK, the Indonesian Ministry for Research and Technology. The Academy organised the symposium under the agreement signed in 2005 for building bilateral cooperation between Indonesia and Australia in scientific research and technological development.

China

Almost 50 researchers from Australia and China discussed the important issue of energy at the Australia-China Energy Symposium in Sydney from 5–7 November, the third annual joint symposium with the Chinese Academy of Sciences.

The symposium, organised by the Academy and the Australian Academy of Technological Sciences and Engineering on behalf of DEST, looked at three crucial areas: transportation fuels, static renewable energy for power generation and traditional energy sources.

Following the symposium, the Chinese delegation visited research facilities including CSIRO Energy Technologies in Newcastle and the ARC Photovoltaics Centre of Excellence at the University of NSW.

The Australian delegation was led by the Presidents of the Academies, Professor Kurt Lambeck and Dr John Zillman FAA and the symposium was officially opened by the Chief Scientist Dr Jim Peacock FAA.

- The program and presentations from the symposium are at: www.science.org.au/events/australiachina/index.htm

The Chinese delegation was led by Professor Yongxiang Lu, President of the Chinese Academy of Sciences, who also made a brief visit to Canberra where he gave a talk on China's future prospects at The Shine Dome on 8 November. Professor Lu outlined the challenges facing China's development and how it is striving to build an innovation-orientated country.

- His presentation is at: www.science.org.au/events/lu.pps

Japan

Scientists from Australia and Japan discussed two increasingly important areas of research at the Australia-Japan Symposium on Earth Systems Science and on Nanomaterials held at the Australian National University from 20–21 November. The symposium, organised by the Academy on behalf of DEST, also provided a forum for participants to identify opportunities for mutual scientific cooperation.

The Japanese delegation was selected by the Japan Society for the Promotion of Science and the Japanese Ministry for Education, Culture, Sports, Science and Technology. Co-convening the symposia were Dr Roger Gifford, Chair of the National Committee for Earth Systems Science, and Professor Neville Fletcher FAA, Chair of the ARC Nanotechnology Network.

Nova: Science in the news

www.science.org.au/nova

Four new topics have recently been posted on the Academy's educational website, *Nova: Science in the news*:

Fixing the cracks in disaster mitigation

Better planning and construction can greatly reduce the impacts of earthquakes and other disasters.

On 17 October 1989, an earthquake measuring 7.1 on the Richter scale rocked the United States city of San Francisco, killing 68 people and bringing more than 24,000 homes crashing down.

This was certainly a disaster but a relatively minor one compared to what hit Izmit, Turkey on 17 August 1999. Registering 7.4 on the Richter scale, it took the lives of at least 17,100 people and flattened 300,000 homes.

Why would two earthquakes of similar magnitude have such different impacts? Timing had something to do with the difference in casualties but the main reason was that San Francisco was more prepared. Most houses, offices, sports stadiums, roads and bridges had been built to resist earthquakes and emergency services were ready to lend assistance throughout the city.

In Izmit, many buildings had been poorly constructed and it was mostly these that collapsed. There was no real emergency plan: thousands of people made homeless by the quake had nowhere to go and little access to medical services. Diseases such as typhoid and hepatitis quickly became killers.

- Topic supported by Geoscience Australia (www.ga.gov.au).

A quiet revolution: the science of complex systems

If you haven't heard of complex systems don't worry, you're not the only one.

Most of us at some stage have thought that the world is a complex place. Things are never straightforward or simple.

Many scientists have noticed the same thing in their research and wondered why this might be the case. They realised that knowing about



Image: Philippe de Courcy

Complex isn't it? A computer generated pattern

the parts of a system does not often tell us how things work as a whole. Systems that behave this way are called complex systems and efforts to better understand them are creating a revolution in science.

It's a revolution because working with complex systems goes against traditional science practice. Until now, scientists have spent a lot of time breaking things down into ever smaller component parts — known as reductionism — to understand how each part works in isolation from other parts, only to find that this does not help to understand how the whole system works together.

Now, scientists are bringing the pieces of the puzzle together to look at the interactions between components of a system to understand how the whole system works.

- Topic supported by the Australian Research Council Complex Open Systems Research Network (www.complexsystems.net.au).

Epigenetics: beyond genes

Recent developments in epigenetics suggest that you may inherit more than genes from your parents.

Epigenetic factors regulate the amount of gene activity, influencing

the growth and appearance of an organism. Malfunctions in epigenetic control of gene activity have been implicated in cancer, cardiovascular disease and several inherited genetic conditions.

In one form of epigenetic control — DNA methylation — chemical tags called methyl groups are attached to the bases from which DNA is made, preventing the expression of genes.

Once a gene has been tagged, all the daughter cells from that cell retain the tagging pattern. Changes made to DNA are perpetuated every time the cell divides: eventually, many cells carrying the modification will exist.

Although most DNA tagging is thought to be 'reset' when sperm and eggs are formed, there is evidence that the tagging pattern of some genes can be inherited by offspring. This is causing a stir in biology because it suggests that environmental stresses such as smoking or malnutrition can have health impacts on that person's descendants for several generations.

- Topic supported by the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series ([//oliphant.org.au/index.html](http://oliphant.org.au/index.html)), funded by the Australian Government under the International Science Linkages Programme.

Nova: Science in the news

Making every drop count

Would you drink a glass of treated effluent?

In a recent referendum residents of the city of Toowoomba, south-east Queensland, rejected a scheme to recycle sewage to top up drinking water supplies.

The issue divided the small community and roused passions but it also highlights a major issue facing all Australians. A drying climate due to global warming and a growing population has created the need to find and adopt innovative, sustainable methods to slake our thirst for water.

Researchers and water authorities in Australia say there's no scientific or health reason that recycled wastewater can't be safely used as part of drinking water supplies if treated properly.

But there can be a formidable psychological reason. It's called the 'yuk factor'—based on the thinking that the water in the glass in your hand might have begun its travels in someone's toilet bowl.

Although there are differing views, researchers and health authorities say it's possible to recycle water to the relevant standard for any use required.



Fighting the 'yuk factor': differing views on recycled water

- Topic sponsored by the Australian Research Council Linked Learned Academies Special Project Grant: www.arc.gov.au/grant_programs/linkage_learned.htm

The Commonwealth Bank Foundation (www.commbank.com.au/foundation) is the principal sponsor of *Nova: Science in the news*. The Australian Foundation for Science is also a supporter of *Nova*.



Primary Connections cemented its place as a world-class program at a recent meeting of the InterAcademy Panel (IAP).

The meeting, in Santiago, Chile, delivered the IAP report evaluating inquiry-based science education (IBSE) programs for primary school students around the world.

Secretary for Education and Public Awareness Professor Julie Campbell FAA was co-chair of the IAP Working Group evaluating IBSE and also chaired one of the discussion groups at the meeting. Managing Director of *Primary Connections* Shelley Peers also delivered a presentation on the *Primary Connections* project and evaluation challenges for Australia.

Professor Campbell said: 'This meeting has shown that the Australian Academy of Science and indeed Australia are very well advanced in the area of inquiry-based science education.

PrimaryConnections fares well at InterAcademy Panel

It is clear that *Primary Connections* is a quality, world-class project.'

The quality of the *Primary Connections* program is reinforced by the stature of the teachers involved, including three recent award-winners. Marj Colvill from Perth Primary School in Tasmania was awarded the Prime Minister's Prize for Excellence in Science Teaching in Primary Schools in 2006. This follows on from Mark Merritt of Marmion Primary School in Western Australia who received the award in 2005. Rossmoyne Primary School's Monique Hill was a joint winner of the Western Australian Premier's Prize for Excellence in Science Teaching (Primary) in 2006.

With award-winning teachers and an Australian Publisher's Association Award, *Primary Connections* is well placed for increased uptake in primary schools Australia-wide.

There are now seven units available for purchase — the first order for the

three new units was placed within 27 minutes of the order form being posted on the website!

More information on the project can be found at: www.science.org.au/primaryconnections



Professor Julie Campbell: making connections

OBITUARIES

Ian Ross



Ian Gordon Ross was born in Sydney on 5 July 1926 and died in Queanbeyan on 14 November 2006. He was educated at the University of Sydney and at University College London, where he received his PhD.

In 1954, after a year as a Postdoctoral Fellow at Florida State University, he returned to the University of Sydney as a lecturer in chemistry, a position he had held briefly in 1949. He quickly rose to senior lecturer and in 1964, to reader. In 1968 he moved to the Australian National University as Professor of Chemistry, in 1977 he became Deputy Vice-Chancellor and from 1989–90 was Pro Vice-Chancellor (Special Projects).

He was instrumental in setting up Anutech, the commercial arm of the University and was a Director from 1979–97. He was also a driving force behind the establishment of undergraduate and postgraduate engineering at ANU. In recognition of this, the building housing the Faculty of Engineering and Information Technology was named after him. The University also awards the IG Ross Scholarship each year to the top student in 1st year chemistry.

Professor Ross also played a significant role outside the ANU, particularly in science and technology policy. He was one of the longest-serving members of the predecessor to the Australian Research Council—the Australian Research Grants Committee—which he also chaired for three years.

He led government inquiries into government laboratories and facilities (1982–83) and higher education libraries (1990). He was the first Secretary (Science Policy) of the Australian Academy of Science from

1989–93. As chair of the Physical Sciences Panel of the Cooperative Research Centres Committee from 1990–95, he led four rounds of assessments of new proposals for CRCs in the physical sciences.

His work covered four main areas: molecular orbital calculations relating to energy levels and bonding in substituted aromatic compounds and inorganic complexes; experimental and theoretical work on electronic and vibrational absorption spectra and with fluorescence spectra of a variety of conjugated organic compounds; theoretical papers on problems concerning the absorption and luminescence spectra of complex organic molecules; and the theory of unimolecular reactions.

Honours included Fellowship of the Royal Australian Chemical Institute 1960; HG Smith Medal, Royal Australian Chemical Institute 1971 and Fellowship of the Australian Academy of Science 1973. He was appointed an Officer of the Order of Australia in 1994. The Australian National University awarded him an honorary LLD in 1997.

In 1975 he married Viola Bartlett, who predeceased him.

Bob Symons



Robert Henry Symons was born in Merbein, Victoria, on 20 March 1934 and died in Adelaide on 4 October 2006. He was educated at the University of Melbourne, where he received a degree in agricultural science and a PhD.

After two years in Cambridge as a postdoctoral fellow he returned to Australia in 1962 to take up a position as a lecturer in the Biochemistry Department at the University of Adelaide, the institution where he was to spend the rest of his working life. In 1967, he was promoted to senior lecturer, he became a reader in 1973 and in 1987 he was appointed to a Personal Chair.

He joined the Waite Agricultural Research Institute as a professor in the Department of Plant Science in 1991, retiring in 1999 as an Emeritus Professor.

During his time at the Waite Institute he became the first director of Waite Diagnostics in the School of Agriculture, Food and Wine.

Bob Symons was a molecular plant virologist who worked on nucleic acid biochemistry and plant disease, making his greatest mark in the molecular biology of plant viroid diseases. His development of a method to label gene probes with photobiotin for the rapid diagnosis of pathogens of plants and animals made an important contribution to basic knowledge about nucleic acids and to medical technology. He also discovered how viroid RNA self cleaved, with the crucial piece of RNA folding up in the shape of a hammerhead, leading to the widely accepted term 'hammerhead ribozyme'.

Bresa (later Bresagen), one of the first Australian biotechnology companies to spin out of a university, was established in the University of Adelaide Department of Biochemistry in 1982 through Bob Symons's nucleotide and plant viral research. It was the first biotech company in Australia to supply radionucleotides and other reagents for molecular biologists.

In 2000 Bob was one of the organisers of the 13th meeting of the International Council for the Study of Viruses and Virus-like Diseases of the Grapevine in Adelaide—the first time this meeting had been held in the Southern Hemisphere.

Honours included election to the Fellowship of the Australian Academy of Science in 1983 and the Royal Society in 1988 and an honorary DSc from Macquarie University. In 1985 he won the Lemberg Medal of the Australian Biochemical Society.

Bob leaves his wife Verna, children Helen, Richard, Alison and Michael, and eight grandchildren.

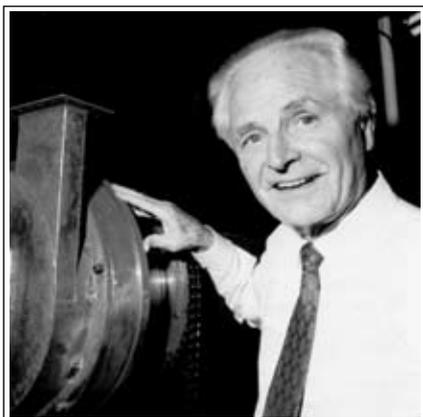
Biographers

Memoirs of deceased Fellows are published in *Historical Records of Australian Science* and are also available on the Academy's website:

www.science.org.au/academy/memoirs

The biographers for Professor Bob Symons are Professor George Rogers and Professor Bill Elliott.

Howard Worner



Howard Knox Worner was born at Swan Hill, Victoria, on 3 August 1913 and died in Wollongong on 17 November 2006. He studied applied chemistry at the Bendigo School of Mines, graduating as a Gold Medallist of the College, then went to the University of Melbourne, where he graduated BSc with first-class honours and the Exhibition in Metallurgy in 1934. He was awarded a DSc in 1942.

He moved between academia and industry as his career progressed.

A lecturer in metallography at the University of Melbourne 1936–38 and Professor of Metallurgy 1946–55, the years 1939–46 were spent as a research fellow at the Dental Materials Research Laboratory, Melbourne. In 1956 he became Director of Research, Broken Hill Pty Ltd and moved to Newcastle, where he established the first Central Research Laboratories for the company. From 1964 until his 'retirement' in 1975 he was Director of New Process Development, CRA Ltd, where he developed bath smelting using the WORCRA process.

After his formal retirement he chaired energy committees of both State and Federal Governments and served as Director, Microwave Applications Research Centre at the University of Wollongong from 1987–89. At this time he developed the 'EnvIRONment' method of recycling sewage sludge and steelworks dust to make iron and zinc oxide pigment.

His most distinguished contributions were in the development of continuous smelting and refining processes, notably those for continuous iron and steel making, continuous copper and nickel smelting-converting and for continuous tin smelting-

refining. He also worked on dental and surgical materials, publishing 50 papers.

Professor Worner received a number of awards throughout his long life. He was appointed CBE in 1977, elected a Fellow of the Australian Academy of Science in 1973, a Foundation Fellow of the then Australian Academy of Technological Sciences in 1976 and also was a Fellow of a number of scientific associations.

Other honours included the Syme Prize (1940), the Silver Medal of the Australasian Corrosion Association (1964), the Kernot Medal, University of Melbourne (1974), the Docking Medal, International Association for Dental Research (1983), the Johnson Medal, Mineralogical Society of SA (1986), the Ian Wark Medal (1994) and the Benjamin F Fairless Award—the most prestigious award in the international steel industry (2002). He received honorary doctorates from several Australian universities.

Married to Rilda Muller in 1937, they had two sons and a daughter. Rilda and one son, John, predeceased him. He leaves his daughter, Ruth, his son, Colin, eight grandchildren and nine great-grandchildren.

They're honoured, these Fellows

Professor Sam Berkovic, University of Melbourne, has been awarded the 2006 Royal Society of Victoria Research Medal for Human Health or Medical Sciences for his work on epilepsy.

Professor Henry G Burger, Prince Henry's Institute of Medical Research, has received the NAMS/Procter and Gable Pharmaceuticals 2006 Morrie M Gelfand Leadership Award in Androgen Research.

Professor Bill Compston, Australian National University, has been elected an Honorary Fellow of the Chinese Academy of Geological Science and awarded the Chinese Government Friendship Award for his outstanding contribution to the development of Chinese science and education.

Professor Ross Crozier, James Cook University, has received the inaugural Hamilton award from the International Union for the Study of Social Insects (IUSSI) for his work on the evolution of social insects and for fostering the careers of leading researchers.

Professor Derek Denton, University of Melbourne, has been awarded an Honorary Doctor of Laws by the University of Melbourne.

Professor Tom Healy, University of Melbourne, has been awarded the inaugural *Nature* lifetime award for mentoring excellence in Australasian science.

Professor John Ralston, Ian Wark Research Institute, has received the 2006 South Australian Premier's Science Excellence Award for research and leadership.

Professor Richard Shine, University of Sydney, has been awarded the 2006 Botanic Gardens Trust Eureka Prize for Biodiversity Research for his outstanding contribution to the conservation of Australia's biodiversity.

Professor David Solomon, University of Melbourne, was awarded the Victoria Prize for his work in polymer chemistry, including developing the world's first plastic banknote.

Professor Raymond Stalker, University of Queensland, has been awarded the 2006 ANZAAS Medal for developing the shock tunnel known as the Stalker Tube and building a world class team of scientists and engineers over four decades.

Professor Terence Tao, University of California, has been awarded the International Mathematical Union 2006 Fields Medal for outstanding mathematical achievement. Professor Tao has also received a 2006 MacArthur Fellowship from the John D and Catherine T MacArthur Foundation for 'bringing technical brilliance and profound insight to a host of seemingly intractable problems in such areas as partial differential equations, harmonic analysis, combinatorics and number theory.'

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Regional Fellows 'Cool' scientists meet art

NSW Regional Group

Highlight of the NSW Regional Group's annual dinner was an entertaining talk on 'Serendipity and intrigue in industrial inventions' by Don Napper. The dinner was held at the Alio Restaurant, Surry Hills on 14 November 2006. The Group has been very active this year and has shared several gatherings with NSW Fellows of the Academy of Technological Sciences and Engineering.

Victorian Regional Group

A Christmas party for Fellows and guests was held by the Victorian Regional Group at the Observatory Café in the Royal Botanic Gardens, South Yarra on 23 November 2006. Chair Tony Klein has been keeping Victorian Fellows up to date, producing five newsletters this year.

WA Regional Group

It was a double date for the Western Australian Regional Group and the WA Fellows of the Academy of Technological Sciences and Engineering, who held a joint Christmas dinner on 5 December at the Royal Freshwater Bay Yacht Club, Peppermint Grove.

SA Regional Group

Following the High Flyers Think Tank 'Innovative technical solutions for water management in Australia' in Adelaide on 30 October 2006, many South Australian Fellows and their guests joined Academy President Kurt Lambeck for an enjoyable dinner at the Universal Wine Bar.

Canberra Fellows Dining Club

A Combined Academies dinner was hosted by the Canberra Fellows Dining Club on 8 December. Fellows from the four Academies enjoyed drinks on the lawn outside The Shine Dome followed by dinner in the Jaeger Room.

Portraits of 25 Australian scientists, including seven from the Academy's *Interviews with Australian Scientists*, were recently exhibited at CSIRO Discovery in Canberra.



Another perspective on Dr Liz Truswell



Another perspective on Professor Adrian Horridge

And the project has been so successful that CSIRO is now looking to go national next year.

The CSIRO 'Portrait of a Scientist' project enabled Year 11 art students from two schools in the Canberra region, Merici College, Canberra and Karabar High School, Queanbeyan, to meet research scientists and create portraits that demystify the stereotypical image of scientists.

The scientists involved in the project ranged from PhD students beginning their scientific careers through to more senior researchers. The students captured the essence of their subjects using paint, sculpture and digital media. Many of the young artists were pleased to discover that scientists are normal. Some even went so far as to say that scientists are 'cool'.

The exhibition was launched by Academy Fellow and local Canberra artist Dr Elizabeth Truswell. The portraits were on display from 4–16 October, before being moved to Parliament House for a showing at the Prime Minister's Science Prize ceremony.

Scientists from the *Interviews* project who featured in the exhibition were Dr Jane Wright and Academy Fellows Dr Max Day, Dr Liz Dennis, Professor Neville Fletcher, Professor Adrian Horridge, Dr Elizabeth Truswell and Dr Hugh Tyndale-Biscoe.

Ingenious chemistry wins Le Fèvre Prize

The 2006 Le Fèvre Memorial Prize has been won by talented young chemist Associate Professor Michael Sherburn, who works in organic synthesis and host-guest chemistry at the Research School of Chemistry at the Australian National University.

He has developed ingenious new methods of synthesising polycyclic natural products including the anti-cancer agent podophyllotoxin and of increasing the efficiency of chemical synthesis.

Dr Sherburn and his team also have created a superbowl container molecule that can capture and release drugs and chemicals. The molecule is shaped like a nanoscale football stadium—a rigid hollow sphere with the top chopped off,

allowing 'guest' molecules to pass in and out.

The interior is big enough to hold molecules of up to 100 atoms and is the key to the superbowl's potential applications, including delivering medicinal agents and removing environmental toxins.

Beyond the medical and environmental applications, Dr Sherburn envisages chemical reactions taking place inside the superbowl. By holding the reactants in the hollow interior, the superbowl may provide the precise locations and orientations required for catalysis.

The award was presented at the Royal Australian Chemical Institute (RACI) awards dinner in Adelaide on 17 November.