



Funding extended for science education programs

The Academy was very pleased to be advised in late June by the Education Minister, The Hon Julia Gillard, that funding is to be extended for the *Primary Connections* and *Science by Doing* programs.

Primary Connections is to receive an additional \$4.4 million to continue producing curriculum units and professional learning for primary school science teachers. The *Science by Doing* project will receive \$2 million over two years to continue developing interactive web-based teaching units for junior secondary students. Current funding for the programs was to end this year, but support

has now been extended to the end of 2010 to fund new stages for both and will align with the work of the National Curriculum Board.

The programs are partnerships between the Department of Education, Employment and Workplace Relations and the Academy, with input from CSIRO and the Australian Science Teachers Association on the *Science by Doing* program.

Primary Connections (www.science.org.au/primaryconnections) has been highly successful in giving primary school teachers the tools to engage their students and harness their natural curiosity to explore how

the world works. The program, developed in consultation with all state and territory education departments, was short-listed for the coveted and prestigious Australian Publishers Association Award in August this year after also being short-listed in 2007 and winning in 2006 in the primary teaching and learning category. Research confirms it is highly successful in classrooms.

Science by Doing (www.sciencebydoing.edu.au) is an online inquiry-based program for junior secondary students designed to promote active learning and stimulate interest in science.

Professor Julie Campbell speaks at National Press Club

Professor Julie Campbell, the Academy's Secretary for Science Education and Public Awareness, addressed the National Press Club on 2 July on inquiry-based science education in Australia in the context of the government's initiative to develop a national curriculum. She also outlined the role that *Primary Connections* and *Science by Doing* programs could play in developing quality national curricula.

Professor Campbell highlighted the importance of science for Australia's future saying: 'The technological world is changing at an incredible rate, and Australia's economy demands high quality science education to cope with this change. Not only do we need specialist scientists who will keep us at the forefront of scientific development, many emerging jobs will demand high level skills in scientific thinking.'

She said nations such as India and China have invested heavily in training scientists and engineers, and warned of complacency in Australia as we are falling behind in this area. She cited the 2006 *Science, Engineering, and Technology Skills Audit* showing that Australia will have a huge shortfall of scientists, engineers and engineering trades people by 2013. Australia is already importing more scientists, engineers and doctors.

'We need to invest seriously in science education. There is a major decline in the number of students electing to study science, technology and mathematics both in senior secondary years of school and at university. In order for Australian students to be motivated to train in these professions, research indicates that they need to have a solid background in science education before age 14 and, most importantly, they have to be

excited by science.' Professor Campbell also emphasised the importance of enthusing would-be teachers.

To address these issues Professor Campbell proposed firstly to make the teaching and learning of science more appealing, both for students and teachers, and secondly to take a national approach to science teaching.

(Continued on page 5)



Julie Campbell discusses national curricula

Photo: © Irene Dowdy

Academy Officers

President

Professor Kurt Lambeck

Secretary (Physical Sciences)

Professor Peter Hall

Secretary (Biological Sciences)

Professor Graham Farquhar

Secretary (Science Policy)

Professor Philip Kuchel

Foreign Secretary

Professor Jenny Graves

Secretary (Education and Public Awareness)

Professor Julie Campbell

Treasurer

Professor Michael Dopita

Published by the Australian
Academy of Science

GPO Box 783
Canberra ACT 2601

www.science.org.au

Telephone: (02) 6201 9400
Fax: (02) 6201 9494

Email: aas@science.org.au

Honorary editor:
Professor Neville Fletcher FAA

Material in this *Newsletter* is
copyright but may be reproduced
with acknowledgment.

Previous *Newsletters* available at:
www.science.org.au/newsletters

ISSN 1031-9204

Gifts to the Academy

If you would like to make a gift or
a bequest to the Academy, please
contact the Chief Executive,
Dr Sue Meek, on (02) 6201 9400 or
ce@science.org.au

SHINE DOME OPEN DAY

AUSTRALIAN ACADEMY OF SCIENCE

Find out what's inside...
2 October 2008

The heritage-listed Shine Dome
will be open to the public on
Thursday 2 October.

This year's open day will include
science talks by Academy Fellows,
tours by architects, construction
footage and scientific artefacts.

Open hours are from 10am to 4pm.

The Dome is located on Gordon Street,
Canberra, adjacent to the ANU campus.

For more information contact
Richard Bray on 02 6201 9452.

Upcoming events

25 September: Lloyd Rees Lecture.

Professor Michelle Simmons FAA, Ian Wark
Lecture Theatre, CSIRO Molecular Science
and Forestry and Forest Products, Clayton,
Victoria.

2 October: Shine Dome open day.

The Shine Dome, Canberra.

7 October: Public lecture by Professor
Martin Green FAA on photovoltaics as
part of *Australia's renewable energy future*
series. The Shine Dome, Canberra.

13 October: Workshop on the
Australia–Japan S&T relationship, on
behalf of the Department of Innovation,
Industry, Science and Research. The Shine
Dome, Canberra.

6–7 November: *Preventative health:
Science and technology in prevention
and early detection of disease.* High Flyers
Think Tank, funded by the Theo Murphy
(Australia) Fund. University of Sydney.

7 November: Ian William Wark Medal
and Lecture. Hyatt Hotel, Adelaide.

10 November: Public lecture by Dr
Tom Denniss on wave energy as part of
Australia's renewable energy future
series. The Shine Dome, Canberra.

12 November: *Affordable low*

emission energy and water. Roundtable
organised by the Embassy of France in
Australia and the Forum for European
–Australian Science and Technology
Cooperation. Shine Dome, Canberra
www.feast.org/france/

16–19 November: *Medical bionics
– a new paradigm for human health.*

Sir Mark Oliphant Conferences –
International Frontiers of Science and
Technology. Lorne, Victoria.

24–25 November: *Remote sensing
technologies and sustainability.* The
Shine Dome, Canberra.

31 January – 4 February 2009:

*Asia-Pacific Congress on Electron
Tomography.* Sir Mark Oliphant
Conferences – International Frontiers
of Science and Technology. Brisbane,
Queensland.

Important dates

30 September: Closing date for Selby
Fellowship, expressions of intent for
the Boden, White and Fenner research
conferences, and the award for research
on endangered Australian vertebrate
species.

International news

US summer program in Australia

For the past five years the Academy and the US National Science Foundation have conducted a joint program that enables twenty US graduate students in science and engineering to visit Australia between June and August each year for a period of eight weeks during the American summer, to undertake research in laboratories and to initiate personal relationships with their Australian counterparts.

The host research institutions such as universities, CSIRO and museums, provide the students with office accommodation, access to laboratory, library and computing facilities, as well as technical assistance and the time and expertise of the host researcher.

The Academy organised a series of lectures and site visits to research and cultural institutions as part of an orientation session for the US students in Canberra from 16 to 18 June. Professor Michael Dopita FAA welcomed the group to the Academy during the orientation session and Dr Hugh Tyndale-Biscoe FAA delivered a presentation on Australian mammals.

This activity is funded by the Department of Innovation, Industry, Science and Research International Science Linkages Program.

Korea

The Australia-Korea Foundation provided funding to the Academy and the Academy of Technological Sciences and Engineering (ATSE) to manage an exchange program for early-career scientists to undertake research for up to three months in Australia and Korea. Two Koreans and five Australian researchers participated in this activity which ended in June. The program provided an opportunity for researchers to access equipment and expertise, exchange data, collaborate in joint publications, and establish long-term collaborations between institutions. The visits also provided valuable cultural experiences for all involved which enhanced opportunities to conduct future research with their counterpart colleagues.

Pakistan

The Pakistani High Commissioner, His Excellency Mr Jalil Abbas Jilani, paid a courtesy call to the Academy on 25 July. He met with the Foreign Secretary, Professor Jenny Graves FAA, to discuss possible bilateral activities through the Academy and the Pakistan Academy of Sciences. Australia is supporting research



Graduate students from the USA participating in the summer program

and institutional linkages to boost Pakistan's agricultural productivity through the Australian Centre for International Agricultural Research related activities.

Taiwan

On 31 July Professor Jenny Graves, met with Ms Alice Cawte, the representative designate to the Australian Commerce and Industry Office in Taipei. Professor Graves discussed Academy activities with Taiwan, particularly the fruitful collaborations with the National Science Council of Taiwan for the past eighteen years.

China

An international workshop, *Soil-Plant Interactions and Sustainable Agriculture in Arid Environments*, was held in Shihezi, Xinjiang, China, on 11 to 18 July. This was an outcome of the *China-Australia Symposium on Sustaining Global Ecosystems* that took place in Beijing in August 2007.

The workshop had strong representation from Australia, with selected delegates from other countries who have relevant arid-zone research links in China, such as Germany, Israel, Japan and Serbia. The chair of the workshop was Professor Yongchao Liang, Key Laboratory of Oasis Eco-agriculture at Shihezi University. The international organising committee was chaired by Professor Hans Lambers from the University of Western Australia, with Professor Andrew Smith FAA from the University of Adelaide as co-chair. Both were delegates in Beijing in 2007. The Academy supported the participation of

some of the Australian delegates.

There were four sessions: biochemical and microbial processes of nutrient cycling in soil-plant systems; water transport mechanisms and water management in arid ecosystems; physiological and molecular mechanisms of plant adaptation to stressful environments; and nutrient and/or metal bioavailability in agro-ecosystems. The topics ranged from molecular biology to plant productivity and ecophysiology. Selected articles will be published in the international journal *Plant and Soil*.

Delegates considered the workshop to be highly successful in enhancing research networking, and those from China expressed the wish that a second workshop be held, preferably in Australia.



Jenny Graves with His Excellency Mr Jalil Abbas Jilani, High Commissioner of Pakistan

Many Australians now iodine-deficient

Growing concerns about iodine deficiency in women and children have led the Australian Academy of Science's National Committee for Nutrition to urge the food industry to implement a proposal for the mandatory use of iodised salt in bread. The committee would also like to see a government-funded monitoring program on the iodine status of Australians, and an education program for pregnant women.

The results of recent studies have raised concerns and were the impetus for a one-day forum held by the Academy, the Nutrition Society of Australia and the International Life Sciences Institute Australasia at the Shine Dome on 26 May. Most participants agreed that steps must be taken to avoid a more serious situation developing. However there were differing views as to the most effective actions to combat the problem.

Food Standards Australia New Zealand has proposed to mandate the use of iodised salt in all breads*. The proposal is to be fully implemented by September 2009 in both Australia and New Zealand. Although it's a step in the right direction, it does not solve the problem for pregnant women who are the most vulnerable.

Dr Mu Li outlined recent studies on iodine levels of school children in mainland Australia, showing that about 50 per cent are classified as mildly or moderately iodine deficient, with 14 per cent of children in NSW and 19 per cent in Victoria classed as moderately iodine deficient.

Professor Cres Eastman emphasised that even mild iodine deficiency results in a reduction in average IQ and fewer gifted individuals. He noted studies from NSW and Victoria showing iodine deficiency is prevalent in over 50 per cent of pregnant women living in these states.

Deficiency can cause enlarged thyroid glands (goitre), lower levels of thyroid hormones in the blood (hypothyroidism), weight gain, lethargy, intolerance to cold, increased blood cholesterol, mental slowness and reduced heart function. The most damaging disorders are irreversible mental retardation and cretinism.

The current deficiency is not fully understood but may be related to one or more of the following:

- reduced use of iodine-based cleaning products in the dairy industry
- decreased consumption of iodised salt due to greater use of non-iodised salt.



Photo: Stockxpert

Iodised salt: A simple solution to iodine deficiency

The statement *Iodine deficiency in Australia: A call for action* by the National Committee for Nutrition is available from www.science.org.au/natcoms/iodine.htm

* Proposal P1003: Mandatory iodine fortification for Australia
www.foodstandards.gov.au/standardsdevelopment/proposals/proposalp1003mandato3882.cfm

New public lecture series

Addressing the effects of climate change that arise from the accumulation of greenhouse gases depends on reducing the amount of energy we consume that is derived from non-renewable resources, such as coal and oil. But what is renewable energy and when and how will we be able to use it?

One thing is clear; there is no one simple answer to achieving sustainability. The Academy's latest public lecture series will examine a range of renewable energy technologies that are currently being developed, and provide a realistic assessment of their ability to supply Australia's energy needs into the future. Each lecture will focus on a renewable energy source such as wind, wave, photovoltaics, solar thermal, fuel cells, biomass and geothermal.

Leading researchers in their field will answer key questions: How does it work?



What is the current stage of development? What are the relative costs? When will it be commercialised? How will it be deployed?

The series opened with Dr Barney Foran from the Fenner Centre for Research and Environmental Studies, Australian National University on 2 September. He provided an assessment of Australia's economic, political and technological landscape for change to a renewable energy future.

Subsequent lectures will be on the first

Tuesday of every month with the exception of the November lecture which will fall on the Wednesday due to the Melbourne Cup. Professor Martin Green FAA will speak about photovoltaic energy on Tuesday 7 October and Dr Tom Denniss from Oceanlinx will speak about wave energy on Wednesday 5 November.

Further information on the series is available from: www.science.org.au/events/publiclectures/re/

Conservation of endangered Australian vertebrates: Research update

Determining the ages of shark, ray, skate and chimaera populations in a non-lethal way

by Christopher Izzo, University of Adelaide

This study, supported by the Academy's Award for research on the conservation of endangered Australian vertebrate species, is the first to investigate the use of telomere length to determine the age of sharks, rays, skates and chimaeras (chondrichthyan species). Identifying the age structure of these populations is fundamental to fishery science, as it forms the basis for ecological risk assessments of exploited populations and is used to identify species that need to be managed and conserved.

The most commonly used method is counting the number of growth bands in calcified structures such as the vertebrae and fin spines. This technique is limited by the subjectivity and interpretation of the researcher, the availability of calcified structure and the destructive nature of the sampling. Due to these drawbacks, the development of alternative ageing methods is much needed.

Telomeres are distinct sections of repeated DNA sequences that occur at the ends of all eukaryotic chromosomes. Each time the DNA is copied, the telomeres can be either shortened or maintained in length. There are strong relationships between the length of telomeres and age in several species of birds, reptiles and mammals, including humans. This study examined telomere length in chondrichthyans and analysed different tissues to find out which is best for age analysis.

Six species were used: the Port Jackson shark; piked spur-dog; southern fiddler ray; sparsely spotted stingaree; thornback skate; and the elephant shark. Telomeres were also measured in a species of teleost



Alternative ageing method still needed for sharks and relatives

(the largest group of fishes), Degen's leatherjacket.

The results showed that the telomere length of the DNA extracted from muscle tissue of the six chondrichthyan species did not significantly change with age. The choice of tissue sampled did not have any affect on the results. The findings show that telomere length is not a suitable way to determine the age of chondrichthyan fishes.

The data shows that chondrichthyans have longer initial telomeres than any other taxonomic group examined so far. Longer initial telomeres are associated with increased fitness, survival rate, lifespan and the longevity of cell replication.

The findings suggest that telomere length is maintained at a near constant length throughout the entire life history of chondrichthyans by an undetermined factor. This may be a key evolutionary factor which has enabled this group to live long lives, with some species living in excess of seventy years.

Similar results have been obtained in species of turtles, another long-lived group of animals. Of the six chondrichthyan species examined, five had telomere lengths that increased over time. A general

increase in telomere length has only been documented in one other animal to date, Leach's storm-petrel (*Ocenodroma leucorhoa*).

Increased levels of telomerase, an enzyme that allows cells to continue to replicate, have been linked to the immortalisation of several marine vertebrate and invertebrate species. The possibility that chondrichthyans have increased telomerase levels in all tissues may explain how this group is able to undergo constant scale and tooth replacement and possess advanced healing properties.

In contrast, the telomere measurements of Degen's leatherjacket showed that telomere length decreased with increasing age. Telomere length may therefore be suitable to determine the age of teleosts fishes.

The Academy is calling for applications for its award for research on the conservation of endangered Australian vertebrate species. The closing date is 30 September. Further information is available from www.science.org.au/awards/conservation

(National Press Club address continued...)

Professor Campbell then went on to demonstrate how *Primary Connections* and *Science by Doing* programs can do both these things: 'The Australian Academy of Science has already developed a successful model for an inquiry-based national science

curriculum for primary schools and is in the process of developing a follow-up program for junior and middle high schools ... both programs move away from teacher delivery of knowledge and pay more attention to a hands-on approach and discussion, open questioning and higher order thinking.'

On behalf of the Academy she

applauded the funding extensions for these programs: 'This is wonderful news indeed and a total relief to all of us at the Australian Academy of Science who have put so much work into these programs.'

A full transcript of the address is available at: www.science.org.au/events/npc2008

Photo: Stockexpert

News from national committees

Antarctic research

The National Committee for Antarctic Research met at Ian Potter House on 18 June. Prior to the meeting, the Committee attended the launch by The Hon Peter Garrett, MP, Minister for the Environment, Heritage and the Arts, of the Mawson's Huts Historic Site Management Plan, at Parliament House.

International Polar Year (2007–09), the Australian Antarctic Program Science Strategy and the Scientific Committee on Antarctic Research meetings, held in July in Russia, were major topics for discussion.

Astronomy

The National Committee for Astronomy (NCA) met on 8 July, during the Annual Scientific Meeting of the Astronomical Society of Australia. The meeting was held at the School of Physics, University of Western Australia, and was preceded by a joint meeting of the NCA and astronomy heads of departments.

Discussion items included Astronomy Australia Limited, the International Year of Astronomy in 2009, Australia's International Astronomical Union membership and coordination of bids for funding from the *Linkage Infrastructure, Equipment and Facilities* scheme.

Biomedical sciences

Following on from the success of the National Forum on Education in Biomedical Sciences, work force planning was a major item for discussion at a meeting of the National Committee for Biomedical Sciences held at the Academy on Tuesday 3 June. Codes of ethics and Academy involvement in the 50th anniversary of the Endocrine Society of Australia were also on the agenda.

Medicine

Professor Bob Williamson FAA convened his final National Committee for Medicine meeting as chair on 31 July. The meeting was held at the John Curtin School of Medical Research. The agenda included discussion on research misconduct, the innovation green paper, translational research, capacity building with Indigenous health research, and mentoring and skills acquisition.

Professor Warwick Anderson, CEO of the National Health and Medical Research Council, Professor Kurt Lambeck FAA and Professor Philip Kuchel FAA, joined the latter part of the meeting.



Members of the National Committee for Antarctic Research

Plant and animal sciences

The National Committee for Plant and Animal Sciences met by teleconference on Friday 23 May 2008. Issues discussed included difficulties in attracting PhD students, development of a 'Future Biological Map of Australia', and Academy support for systematics and phylogeny.

Space science

The draft of the first *Decadal Plan for Australian Space Science* was the major topic for discussion at a meeting of the National Committee for Space Science held on the morning of 22 May. In the afternoon, the Steering Committee for the draft plan met with President Lambeck to discuss feedback on the draft release.

A follow-up meeting was held at the Academy on 30 July with representatives of the space science community, the Earth

observation community, the Australian Academy of Technological Sciences and Engineering, and the Australian Academy of Science. The principal purpose of the meeting was to consider how to better reflect the spectrum of interests and requirements of the Earth observation community in the plan.

The meeting recommended that Australia's space science policy over the next decade be developed in three parts:

- a plan for science of space
- a plan for Earth observation
- an umbrella document which integrates and prioritises science and technology directions and investments from the first two parts.

More information on the draft *Decadal Plan for Australian Space Science* can be found at www.physics.usyd.edu.au/~ncss/



Earth observation: On the agenda for space science

Terrestrial Carbon Task Force

A meeting of the Terrestrial Carbon Task Force was held at Ian Potter House on 2 July. The aim for the meeting was to discuss the draft report *Vegetation dynamics and global climate change: Research priorities for the next decade*, a synthesis of the workshop on vegetation and climate change on 14 and 15 August 2007. The draft report was prepared by Dr Roger Gifford, chair of the National Committee for Earth System Science.

International unions

Professor Allan Chivas, professor of geosciences, School of Earth and Environmental Sciences, University of Wollongong, and member of the National Committees for Earth Sciences and Quaternary Research, is the new president of the International Union of Quaternary Research.

Meeting of Nobel Laureates in Lindau

Professor Ron Ekers FAA accompanied the Academy's delegation of seven young physics researchers to the Meeting of Nobel Laureates in Lindau, Germany, 29 June to 4 July 2008. Reports are now being received from the delegates.

Adam J Berry Memorial Fund

Expressions of interest are invited from junior scientists (thirty years of age or under) to visit the National Institutes of Health in the USA. Proposals in any health-related field of natural science will be considered. Only citizens and permanent residents of Australia are eligible to apply. At the time of application, applicants should be either in the first two years of a PhD degree or equivalent, or have completed a Masters or a Bachelors with Honours degree, or be in the final semester of a Masters or a Bachelors with Honours degree. The deadline for expressions of interest is 3 October 2008 for travel in 2009.

Further information: www.science.org.au/internat/berry

Fellow turns 90

Best wishes to Wes Whitten (FAA 1982), who turned 90 on 1 August. He was born in Macksville, New South Wales and educated at the University of Sydney. After war service and three years with CSIRO Division of Animal Health, he was appointed to set up the Animal Breeding Establishment at the John Curtin School of Medical Research at the Australian National University in 1950. In 1961 he moved to the National Biological Standards Laboratory, Canberra, as assistant director (Endocrine Products)

and in 1966 to the Jackson Laboratory, Bar Harbor, Maine, USA. He has described the 14 years he spent there as the most exciting of his scientific career. After his retirement he returned to Australia as a research associate in the Department of Zoology at the University of Tasmania. The synchronisation of the oestrous cycles of a group of females living together, occurring only when a male or his pheromone is present, was first reported by him and is known as the Whitten effect. He also formulated Whitten's medium, the standard in all embryonic culture experiments for over 50 years.

Australian-European Cooperation in S&T Research (COST)

The Academy invites applications from Australian researchers to be involved in EU COST Actions. Grants provided are to attend discussions and meetings in the 2008–09 financial year that foster scientific collaborations with colleagues participating in COST actions.

To become an official member of a COST Action, Australian researchers need to contact the chair of the

relevant COST Action Management Committee. The database of COST Actions including contact details can be found at: www.cost.esf.org/index.php?id=26

Applications are funded in chronological order of receipt until funds have been committed. Further information is available from: www.science.org.au/internat/cost

Faye Nicholas leaves Academy secretariat

Faye Nicholas retired from the Academy on Thursday 31 July after 19 years of dedicated service. Faye joined the Academy secretariat in 1989 and has worked in a variety of capacities during the terms of six presidents, including activities related to the National Science and Industry Forum, the National Academies Forum, Awards, and the Annual General Meeting. Her diplomacy and keen wit have earned her the respect and friendship of many Fellows and staff. We give Faye our sincere good wishes for a happy and adventurous retirement.



The Fellowship team on Faye's last day: Caroline Giddings, Faye Nicholas and Lynda Folkard

Nova: Science in the news

Two new topics have recently been posted on the Academy's educational website, *Nova: Science in the news* (www.science.org.au/nova):

Stormwater – helping to tackle Australia's water crisis

With reduced water supplies and a growing population, should Australians be letting stormwater go down the drain?

Water is a big issue in Australia. There are water restrictions in most major cities, and climate change and recurrent droughts affect our agriculture industry. There are ever-increasing pressures on our water supplies. Our population is growing – it's predicted to reach 25 million by 2032. And we will be very thirsty indeed, because the world will be a hotter place by then.

Global warming is expected to decrease rainfall in Australia's 10 largest cities by an average of 15 percent by 2030. It's pretty clear that we need to make some changes to the way we use water.

For Australia to effectively address the water crisis, a range of water management strategies need to be used. Desalination plants, recycled water and stormwater can all play a part in helping to tackle the water crisis.

Until recently, little attention has been paid to the reuse of stormwater. In most towns and cities, stormwater runs directly into a dedicated drainage system designed to carry the water away as quickly as possible into natural waterways or the ocean. While it's tempting to think of all the ways wasted stormwater could be used, it's not as simple as directing stormwater drains into a dam. Firstly, suitable storage areas need to be established. In addition, before stormwater can be safely used, pollutants have to be removed. One solution to the problem of pollutants in stormwater is to make stormwater systems more like natural waterways. Australian researchers are exploring the use of gardens, creeks and artificial wetlands to remove pollutants.

This topic is sponsored by the Australian Research Council Linkage Learned Academies Special Projects Grant (www.arc.gov.au/ncgp/lasp/lasp_default.htm). The Australian Foundation for Science is also a supporter of *Nova*.



Photo: Water Research Laboratory, UWS

Biofiltration: Using nature to clean up stormwater

Capturing the Greenhouse Gang

The search is on for ways to capture greenhouse gases and store them out of harm's way.

There is going to be a price placed on the head of the Greenhouse Gang. The increasing atmospheric concentration of greenhouse gases is causing an 'enhanced greenhouse effect', also known as global warming or climate change. Governments and industry are prepared to pay big money for their capture.

Carbon dioxide can be captured in many different ways. Nature has

been doing it for millions of years. To complement biological carbon capture and storage with engineered technologies, the first step is to catch the carbon dioxide. Several techniques already exist to do this, they are expensive, consume considerable quantities of energy and don't catch everything, but they do offer the prospect of long-term storage of the extracted carbon dioxide gas.

One storage possibility is mineral carbonation, which is the fixation of carbon dioxide in the form of inorganic carbonates.

(Continued next page)

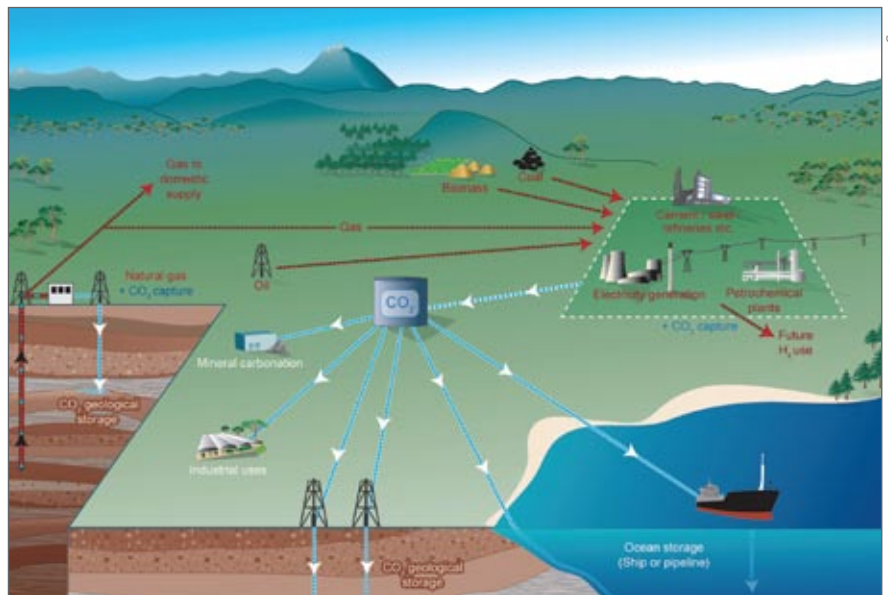


Image: © CO2CRC 2008

Geosequestration: A way to capture one of the Greenhouse Gang


 interviews
with **Australian**
scientists

Some superb interviews have been recorded for the *Interviews with Australian scientists* project in the last few months. In May Professor John Sprent FAA, an eminent parasitologist, was interviewed by Professor Julie Campbell FAA at his home in Moggill, Queensland. In early July, Mr Roy Woodall FAA was interviewed by Professor Richard Stanton FAA. Roy Woodall spent his enormously productive career with the Western Mining Corporation. His discovery of the nickel sulphide ore deposit at Kambalda in 1964 and the Olympic Dam ore body in 1975 have directly affected the Australian economy. In his interview Roy describes how important teamwork was in the discovery of the Olympic Dam site 'the fourth largest copper deposit in the world, the largest uranium in the world ... and gold far exceeding the amounts of gold in Australia's other giant gold deposit, the Golden Mile Deposit, Kalgoorlie'.

In late July, a quartet of scientists was interviewed in Melbourne in a round-robin fashion; Professor Bruce Holloway FAA was interviewed by Professor Ray Martin FAA and Professor John Swan FAA was interviewed by Professor Ron Brown FAA. Interviewers then became interviewees as the roles were reversed with Ray Martin being interviewed by Bruce Holloway and Ron Brown by John Swan. These scientists have much in common professionally



Photo: Maggie Percival

Noble pursuits: Norman Swan, Robin Warren, Fiona Wood and Barry Marshall

and their careers span diverse fields such as genetics, chemistry (both organic and inorganic) and astronomy. Personally they have known one another for many years and often catch up over lunches or a game of tennis.

Most recently, in early August Dr Norman Swan interviewed Professor Barry Marshall FAA, Professor Robin Warren FAA and Dr Fiona Wood in Perth. These interviews provided a fascinating insight into the lives of three intriguing individuals. Barry Marshall and Robin Warren, the winners of the Nobel Prize in Physiology or Medicine in 2005, might never have reached this professional pinnacle if not for the pathologist Warren sticking to his

guns and the young medico Marshall needing a gastro topic to write a paper about. After being Australian of the Year in 2005, life for Fiona Wood has continued on its stratospheric rise as she talks in the interview about her unwavering passion to develop healing techniques for scarless burns. She has always been exceptionally motivated, but the recollection of certain patients and the prospect of better outcomes from greater education keeps her motivated.

These interviews were sponsored by the University of Queensland (JS), Monash University (BH, JS, RM, RB) and the University of Western Australia (BM, RW, FW).

(Continued from previous page)

Implementing mineral carbonation on a large scale, however, faces many obstacles. Another possible repository for unwanted carbon dioxide is the deep ocean or the sediments below the sea floor. However, there are many technological and environmental uncertainties regarding oceanic carbon dioxide storage.

Of all the artificial carbon capture and storage ideas, perhaps geosequestration – also called carbon burial – holds most promise in Australia. Geosequestration is the capture of carbon dioxide and its storage in porous rocks below the surface of the Earth. Old oil and gas fields provide one potential storage option. Deep saline

aquifers might also be used to store carbon dioxide.

No single carbon capture and storage option will solve the problem of escalating greenhouse gas emissions. Most options are expensive and will require substantial technological development. Governments are debating how to stimulate faster progress, by making polluters pay for the greenhouse gases they emit. Putting a price on the head of the Greenhouse Gang will encourage the search for cheap solutions and reduce the quantity of emissions.

This topic is sponsored by the Australian Government Department of Climate Change (www.greenhouse.gov.au). The Australian Foundation for Science is also a supporter of *Nova*.

50th anniversary of Shine Dome opening

In preparation for next year's 50th anniversary of the formal opening of the Shine Dome, which coincides with *Science at the Shine Dome* in May 2009, the organisers would like to receive information and artefacts related to the Dome which could be used or displayed temporarily. If you have any items or information you would like to share, please contact Richard Bray on 02 6201 9452.

Honours to Fellows

Elections to The Royal Society

Professor Yiu-Wing Mai

For research into fracture and fatigue mechanics and materials science.

Dr Roger Everett Summons

For research in organic geochemistry, in particular the molecular record of the Earth's early biosphere.

Queen's Birthday honours

Order of Australia

Officer (AO) in the General Division

Professor John Ralston

For service to science and to scientific research, particularly in the field of physical chemistry and minerals processing, to education and to the creation and application of new scientific knowledge to industry.

Professor Ian Hugh Sloan

For service to education through the study of mathematics, particularly in the field of computational mathematics, as

an academic, researcher and mentor, and to a range of national and international professional associations.



Ian Sloan

Member (AM) in the General Division

Professor Louis Charles Birch

For service to science, particularly in the field of biology as an academic and

researcher, and through contributions to the understanding of the relationship of science to religion.

Emeritus Professor David Michael Doddrell

For service to science in the field of magnetic resonance as an academic and researcher.

Professor Stephen John Redman

For service to medical science, particularly in the field of experimental neuroscience as an academic and researcher and through contributions to professional organisations.

Other awards

Professor Chennupati Jagadish

was named a Fellow of the American Vacuum Society and elected as a Fellow of the American Association for the Advancement of Science.

Professor Peter Colman was awarded the Victoria Prize for his pivotal role in Australia's quest to develop the world's first anti-influenza drug.

2008 Australian Museum Eureka Prizes

The Australian Museum Eureka Prizes reward excellence in the field of research and innovation, science leadership, school science and science journalism and communication. This year's awards were presented on 19 August at the Convention Centre, Royal Randwick Racecourse.

Professor Steve Simpson won the Eureka Prize for Scientific Research for his work on the protein intake of grasshoppers and its implications for understanding human obesity.

Professor Robert Clark won the Eureka Prize for Leadership in Science



Steve Simpson



Photo: © Steve Simpson

Cricket cannibalism: Clues to human obesity?

for his leadership in advancing quantum computing research.

Professor Lorenzo Faraone is a member of the research group that won the Eureka Prize for Science in Support of Defence or National Security. The Microelectronics Research Group of the University of Western Australia won the prize for their microspectrometer sensing technology that brings colour vision to infrared sensing.

Professor Martin Green is a member of

the research school that won the Eureka Prize for Innovative Solutions to Climate Change. The University of New South Wales School of Photovoltaic and Renewable Energy Engineering won the prize for advancing solar energy by producing economically efficient, high performing solar cells.

For full details of Eureka Prize winners go to: www.austmus.gov.au/eureka/go/finalists

Frank Gibson



Frank Gibson

Frank William Ernest Gibson was born in Melbourne on 22 July 1923 and died in Canberra on 11 July 2008. He began his tertiary studies at the University of Queensland, but completed them at the University of Melbourne, where he was awarded a BSc in 1949 and a DSc in 1964. His postgraduate study was undertaken at the University of Oxford (DPhil 1953, MA 1982).

Returning to the University of Melbourne in 1953, Frank was a senior lecturer until his appointment as a Reader in Chemical Microbiology in 1949 and as Professor of Chemical Microbiology in 1965. In 1967 he moved to the John Curtin School of Medical Research at the Australian National University (ANU), where he was to stay until his retirement. From 1967 to 1976 and 1980 to 1988 he was Head of the Biochemistry Department, and from 1977 to 1980 he was Director and Howard Florey Professor of Medical Research. In 1988 he became Head of the Division of Biochemical Sciences and in 1989 an Emeritus Professor and a University Fellow.

Frank played a leading role in elucidating the steps in the biosynthesis of aromatic compounds by bacteria and regulation of the processes involved. In this work a series of new intermediates and a long series of new enzymes were discovered; one of the new intermediates, chorismic acid, proved to be the key branch point from which diverge the biosynthetic pathways to aromatic amino acids and various vitamins including a new bacterial vitamin 2,3-dihydroxybenzoic acid. His work involved a combination of bacterial genetics, biochemistry and organic chemistry.

Frank was elected to the Fellowship of the Australian Academy of Science in 1971 and served as Vice-President from 1989 to 1990. Other awards and distinctions

include: the David Syme Research Prize of the University of Melbourne (1963); Lemberg Lecture, Australian Biochemical Society 1968; S D Rubbo Memorial Oration, Australian Society of Microbiology (1975); election to the Fellowship of the Royal Society of London (1976); Leeuwenhoek Lecturer, Royal Society of London (1981); and Burnet Lecturer, Australian Academy of Science (1991). In January 2004 he was appointed a Member of the Order of Australia.

An active member of scientific societies, Frank was President of the Australian Biochemical Society in 1978 and 1979 and was later honoured by becoming an Honorary Life Member of both this Society and the Australian Society for Microbiology. His service to University House, ANU, as a member of its governing body was also recognised by an honorary life membership.

Frank and his first wife, Margaret, had two daughters. His second wife, Robyn, with whom he had a son, survives him.

Don Weiss



Don Weiss

Donald Eric Weiss was born in Melbourne on 4 October 1924 and died there on 31 July 2008. After completing two years of the Diploma of Industrial Chemistry at the South Australian School of Mines, he transferred to the University of Adelaide, where he was awarded a BSc in 1945 and a DSc in 1960.

He began his professional career as shift chemist at Associated Pulp and Paper Mills (1945 and 46). In 1947 he joined the Commonwealth Serum Laboratories to work on penicillin development, before moving to the CSIR Division of Industrial Chemistry in 1948, where he began a study of foam fractionation. He spent the remainder of his career at CSIR/CSIRO,

transferring to Physical Chemistry (later called the Division of Applied Chemistry), becoming a Chief Research Scientist in 1965. In 1971 he became Assistant Chief of the Division of Applied Chemistry and Officer-in-Charge of the Forest Products Laboratory. In 1973 he was promoted to Chief of the Division of Chemical Technology, and in 1979 he took up the position of Director of the Planning and Evaluation Advisory Unit. He retired from this position in 1984.

His technical interests were in the fields of adsorption technology, water treatment, forest products and plastic composites. He was the co-inventor and primarily responsible for the development of the 'Sirotherm' desalination and the 'Sirofloc' water clarification processes and was responsible also for initiating and overseeing the R & D that resulted in a new reconstituted wood product 'Scrimber', a new nylon paper wool bale and replacement of asbestos fibres by cellulose fibres in asbestos-cement products.

Don received a number of awards and distinctions. He was elected to the Fellowship of the Australian Academy of Science in 1971 and was a Foundation Fellow of the Australian Academy of Technological Sciences in 1976. Other awards included the Russell Grimwade Prize of the University of Melbourne in 1955, an OBE in 1976 and a CSIRO Medal in 1989. He also won a number of awards from the Royal Australian Chemical Institute – the H G Smith Medal, the Olle Prize, the Leighton Medal and the Applied Research Medal. In 1992 the Solvent Extraction and Ion Exchange Group of the Society of Chemical Industry of Victoria presented him with a plaque in recognition of his innovative work in the field of ion exchange and its applications in practice.

Don was active in a number of scientific associations, and served as Chairman of the Victorian branch of the Royal Australian Chemical Institute as well as President of the federal body. He was also President of the Victorian Branch of the Australian Water and Wastewater Association in 1973 and 74 and the Australian Branch of the International Association for Water Pollution Research in 1979, having already served as an Executive Member for the previous eight years.

Don is survived by his wife Betty, his sons Robert and Peter and four grandchildren.

Academy applauds winners of L'Oréal Australia For Women in Science fellowships

The Academy congratulates Angela Moles, Amanda Barnard, Natalie Borg and Erika Cretney on receiving 2008 L'Oréal Australia For Women in Science fellowships.

The four winners received their \$20,000 Fellowships from Professor David de Kretser FAA, Governor of Victoria, and Mark Tucker, CEO of L'Oréal Australia at a ceremony at Eureka89 in Melbourne on 26 August. Judging was made difficult with over 200 high quality applications. An additional fellowship was added to the established three reflecting the high level of applicants.

The fellowships aim to recognise the contributions of women researchers to scientific progress and to encourage the participation of women in scientific research – a key factor of economic, social and cultural progress.

Evolutionary biologist Angela Moles from the University of New South Wales is a leader in developing a new approach to ecology – one that could allow us to accurately model and predict the impact of climate change on ecosystems.

Theoretical physicist Amanda Barnard from the University of Melbourne will use her fellowship to create computational tools to predict the behaviour of nanoparticles in the environment.

Protein chemist Natalie Borg from Monash University is analysing protein



L-R: Jenny Graves, Erika Cretney, Natalie Borg, Angela Moles, Amanda Barnard and Sue Meek at the ceremony

crystals with synchrotron light, to figure out how our bodies mount a rapid defence when we are attacked by viruses. The fellowship will help her become established as an independent researcher.

Immunologist Erika Cretney from the Walter and Eliza Hall Institute of Medical Research in Melbourne is researching a small group of T-cells that play a role in controlling inflammation and in autoimmune diseases. The fellowship will help with childcare costs as she balances a full-time research career with the needs of her young son.

The fellowships are supported by

L'Oréal Australia, the Australian National Commission for UNESCO and the Academy.

The Academy is delighted to be involved with the L'Oréal Australia For Women in Science fellowship program. President Professor Kurt Lambeck, and Fellows Professors Julie Campbell and Jenny Graves were on the judging panel. The Academy supports early-career researchers through several initiatives including symposia, workshops and international study programs.

Further information about the fellowships is available from: www.scienceinpublic.com/loreal/2008

Photo: L'Oréal/SDP Photo

Taking measuring of the universe

As part of National Science Week the Academy hosted a public lecture on 19 August by newly-elected Fellow Professor Brian Schmidt from the Research School of Astronomy and Astrophysics at the Australian National University.

Professor Schmidt's lecture *Taking measure of our universe* took the well attended audience through a tour of the cosmos, discussing the universe's age, scale and composition, and how these vital statistics are determined. His quote 'We live in what I would describe as a very messy, messy universe' summed up the theme nicely.

He described the expansion of the universe, how this is measured and how the rate of expansion, the Hubble Constant, has been used to roughly determine the age of the universe – around 14 billions years old.

He discussed the possibility that the

universe will continue to expand, defying the forces of gravity, as it has in the past – an infinite universe without end. He also discussed the possibility that this expansion will slow down due to the force of gravity and eventually stop and collapse on itself in a 'reverse Big Bang' or the 'gnaB giB' as it is known. Data has been collected showing that the 'gnaB giB' hypothesis is unlikely to be the fate of the universe.

He went on to discuss 'dark energy' and 'dark matter', which make up 72 and 24 per cent of the universe respectively, with only 4 per cent being the more familiar atomic matter. Astronomers suspect 'dark matter' is a particle remaining to be discovered, perhaps in the Large Hadron Collider project.

Professor Schmidt said 'dark energy' and 'dark matter' are in a constant battle with each other which will affect the fate of the



Exploding star: Clues to an accelerating universe

universe. He presented three theories for the universe's fate: the Big Chill, the Big Rip and the Big Rip Off.

He summed up saying: 'It is probably going to end not with a 'gnaB giB' but with a whimper – but just possibly it will end in a scream during the Big Rip.'

The audio of Professor Schmidt's talk is currently available at: www.science.org.au/events/19august08

The transcript will soon be available from the same page.

Photo: © Peter Challis, Harvard-Smithsonian Center for Astrophysics