



Australia– Singapore Energy Workshop

Following a high-level visit by the Singapore Agency for Science, Technology and Research (A*STAR) in 2008, the Academy of Science and A*STAR, on behalf of the Australian Government Department of Innovation, Industry, Science and Research, organised the Australia–Singapore Energy Workshop. The workshop was held at University House, Canberra, on 14 to 16 June.

The Singaporean delegation was led by Professor Charles Zukoski, chairman of the Science and Engineering Research Council of A*STAR. The Australian co-conveners were Professor Andrew Holmes FAA, a member of the Academy's Council as well as Mr Peter Laver, Vice-President of the Australian Academy of Technological Sciences and Engineering.

The workshop dinner, held at the Shine Dome on Monday 15 June, was attended by senior representatives from the Singapore High Commission, government departments, the ARC, the academies and the Australian National University.



Photo: Shannon Newham

Workshop participants outside University House, Canberra

Approximately thirty Singaporean and Australian invited participants explored collaborative opportunities during plenary discussions and presentations in the areas of carbon capture and utilisation, bioenergy, organic photovoltaics, energy storage devices and intelligent energy distribution systems.

The presentations from each side were thought provoking and led to vigorous and enthusiastic debate. It became clear

that there are a number of areas where existing complementary skills between the Singaporean and Australian researchers would lead to themes of common research interest.

Following the workshop, the Singaporean delegation made site visits to Dyesol Industries in Canberra before flying to Melbourne to visit Monash University, the University of Melbourne and CSIRO. ■

Renewable energy lecture series wraps up

The highly successful *Australia's renewable energy future* public lecture series concluded on 4 August after running for almost a year and regularly drawing near-capacity crowds to the Shine Dome.

Professor Steve Shuck's March lecture covered the hugely diverse range of bioenergy resources available including wood, energy crops, sawmill waste, manures, sewage, food wastes and canola production which can be converted to produce heat and power, chemical 90-feedstocks, ethanol or biodiesel. Currently Australia is producing around 50 gigawatts out of a potential 700 megawatts.

Professor Schuck discussed the food versus fuel debate saying that in Australia we basically use waste products only to produce biofuels, except for one sorghum-based plant in Queensland.

Greenhouse gases produced from biofuels are considerably lower compared to petrol he said. 'Some of the first generation biofuels give something like a 30 per cent greenhouse gas advantage over fossil fuels, depending on whether the feedstocks are waste, how much fossil fuels need to go into the production and the fertilisers. The second generation biofuels can give something like a 90 per cent reduction.'

'In Australia, I am pleased to say, we have a \$15 million second generation biofuels program, which is about to go into the assessment mode for projects.'

Some of the barriers to implementation of bioenergy in Australia include the low cost of fossil fuels, lack of public awareness, the logging of native forests and logging laws concerning waste.

Professor Keith Lovegrove from the Australian National University (ANU) discussed concentrating solar thermal power in his April lecture, detailing the

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Honours to Fellows

2009 Clunies Ross Awards

Professor Hugh Durrant-Whyte for robotics for Australia

Professor John Hopwood for lysosomal disease treatment

Professor John Ralston received the 2009 Clunies Ross Lifetime Achievement Award for mineral flotation processes.

Gruber Prize

Professor Jeremy Mould shared with colleagues, **Dr Wendy Freedman** and **Dr Robert Kennicutt**, the honour of being awarded the prestigious 2009 Gruber Cosmology Prize for resolving the decades-long dispute about the value of the Hubble constant.

Queen's Birthday Honours

Order of Australia

Officer (AO) in the General Division

Professor Robert (Bob) Graham

For service to medicine, particularly through stewardship of the Victor Chang Cardiac Research Institute and research in the field of molecular cardiology.

Dr Bruce Hobbs

For service to science, particularly in the field of structural geology as a leader in the development of innovative research centres and mineral exploration technologies.

Professor Kurt Lambeck

For service to science through the development of policy, the promotion of educational programs and as a researcher and educator in the field of geoscience.

Professor Robert (Bob) McIntosh

For service to agricultural science in Australia and internationally, particularly

through research in the areas of wheat genetics and rust disease and as an educator and mentor.

Member (AM) in the General Division

Professor James (Jim) Stanislaus Williams

For services to the physical sciences and engineering through education, research and administrative roles, particularly in the area of semiconductor physics.

Australian Laureate Fellowships from the Australian Research Council

Professor Richard Hobbs

Professor Anthony (Tony) Thomas

Professor Chennupati Jagadish

Professor Brian Schmidt

Professor Stephen Simpson

Professor Scott Sloan

Other awards

Two new government select-entry schools, similar to Melbourne High School and MacRobertson Girls' High School will soon be established in Victoria named in honour of Academy Fellows. They are: Nossal High School, named after **Sir Gustav Nossal**, which will open at Berwick in term 1 of 2010; and Cory High School, named after **Professor Suzanne Cory**, which will open at Werribee in term 1 of 2011.

Dr Ian Ball of the Australian Antarctic Division, in collaboration with his supervisor **Professor Hugh Possingham FAA** and **Matthew Watts** from The Ecology Centre at the University of Queensland, were awarded the Sherman Eureka Prize for Environmental Research. ■

Important dates

9 September: *Internationalisation of Australian science*. National Press Club address by President Professor Kurt Lambeck. National Press Club, Barton, Canberra. Further information and registration: www.npc.org.au/upcomingSpeakers

28 September–1 October: 9th Australian Space Science Conference. Sponsored and organised by the National Committee for Space Science and the National Space Society of Australia.

University of Sydney, School of Physics.

Further information:

www.nssa.com.au/ocs/index.php?cf=11

1 October: Shine Dome open day. Shine Dome, Canberra. Contact savita.khiani@science.org.au or call 02 6201 9462.

6 October: First lecture in the public lecture series *Water management options for urban and rural Australia*. 5.30–7.00 pm, Shine Dome, Canberra. Contact savita.khiani@science.org.au or call 02 6201 9462.

22–23 October: *Agricultural productivity and climate change: Science and technology responses and adaptations*. Theo Murphy

(Australia) High Flyers Think Tank. The Oaks on Collins, Melbourne.

24–25 October: Nuclear astrophysics in Australia. 2009 Elizabeth and Frederick White Research Conference. Shine Dome, Canberra. Further information: www.cspa.monash.edu.au/activities/white-conference

4 November: Second public lecture in the series *Water management options for urban and rural Australia*. 5.30–7.00 pm, Shine Dome, Canberra. Contact savita.khiani@science.org.au or call 02 6201 9462.

Academy's strong relationship with France recognised in awards

Professor Suzanne Cory FAA and Foreign Fellow of the French Academy of Sciences recently received France's highest honour, Knight of the Legion of Honour, in a ceremony held on 12 June. Former Executive Secretary, Professor Sue Serjeantson, and Manager for International Relations, Ms Nancy Pritchard, were made Officer and Knight, respectively, of the Order of Academic Palms by the French government at a ceremony at the Shine Dome on 21 July. All received their awards for their services in promoting bilateral collaborations in science, education and culture.

The Order of Academic Palms is an order of chivalry of France presented to academics and educators. The order was originally created by Napoleon to honour eminent members of the University of Paris. It is one of the world's oldest civil awards. Originally, the awards were only given to teachers or professors, but in 1866 this was broadened to recognise major contributors to French national education and to include foreigners.

A strong relationship between the Australian and French academies has existed since the mid 1980s when both organisations signed an MOU and began fruitful links, instigated in great part by the late Professor Bede Morris FAA. The French government recognised his contribution to their nation's science by retaining him as a consultant on cattle production and



Michel Thibier from the Embassy of France, Nancy Pritchard, Sue Serjeantson and Kurt Lambeck

by awarding him the honour of Knight of the National Order of Merit. In 1988, shortly before his death, he was awarded the Legion of Honour. In his honour the Academy established the Bede Morris Fellowship in 1990. This Fellowship supports an outstanding Australian scientist to undertake a short term research project in France each year.

Additionally, over the last decade the French Embassy has contributed funding to enable four to five Australian researchers to travel to France each year under the Academy's fellowship exchange

program with Europe. The fellowships are supported by the Department of Innovation, Industry, Science and Research's (DIISR) International Science Linkages program to assist Australian scientists to gain access to knowledge and innovative technologies developed in the international environment. They also promote the international profile of Australian science while strengthening Australia's collaborative links with France. Further information on the Academy's international activities is available from www.science.org.au/internat/index ■

Opening of J-PARC accelerator complex in Japan

The giant new \$1.5 billion Japan Proton Accelerator Research Complex (J-PARC), which was opened in July, has taken more than 12 years to plan and build.

The facility consists of two proton synchrotrons, a neutron source, a neutrino experiment and a hadron facility, and is located in the village of Tokai on the north-east coast of Japan, 120 kilometres from Tokyo. It is one of a number of research institutes in the area operated by the Japan Atomic Energy Agency.

The J-PARC facility generates a range of particles such as neutrons, neutrinos, kaons and muons by accelerating protons and smashing them into various targets. It

has three new machines: a 200 MeV linear accelerator; a 3GeV proton synchrotron; and a 50 GeV proton synchrotron (currently running at 30 GeV).

Over 1000 researchers and guests attended the opening ceremony, including the science minister, Ryu Shionoya. Speaking at the opening, Professor John White FAA, who was chair of the international advisory committee for J-PARC, praised the long-term vision of the Japanese government.

There are also three big scientific labs. One is the Materials Life-Sciences Facility (MLF), which uses the proton synchrotron to generate neutrons and muons for a

range of experiments in materials science and biology. Masatoshi Arai, deputy director of the MLF, is keen to get more researchers from outside Japan to use the neutron source at the MLF.

One feature in the original design of the J-PARC facility, but not yet funded, is a facility to demonstrate the feasibility of accelerator-driven 'transmutation' – the conversion of long-lived radioactive nuclear waste into something with a much shorter half-life. Waste would still need to be stored, but its long-term hazard would be reduced. More information on the facility is available from <http://j-parc.jp/index-e.html> ■

Prize winners explore the rich variety of environmental history

This year's National Museum of Australia Student Prize for Australian Environmental History attracted a very strong and varied field. The prize was shared by Jodi Frawley from the University of Sydney and Benedict Taylor from the University of New South Wales. Two entries, from Kylie Carman-Brown and Lawrence Niewójt, (both from the Australian National University) received an Honourable Mention.

The essay prize is a joint initiative of the Academy and the National Museum of Australia (NMA) and is open to students undertaking research at any tertiary educational institution. The awards were presented at a function at the Academy on 2 June by Dr Craddock Morton, Director of the NMA and Dr Sue Meek, Chief Executive of the Academy.

In her entry, *Trans/Nationalising wattle from the Sydney Botanic gardens*, Jodi Frawley explores the criss-crossing of the national and the transnational paths of the wattle. The essay opens up the idea that what is national can also be transnational, and what is transnational is also global without ever losing the sense of wattle being an iconic Australian tree.

Benedict Taylor's essay was *It is curious how the convict loves a pet: Animals in Australian prisons and penal discourse*. Prisoners have a long history of keeping pets and Taylor shows how these



Photo: Stockxpert

Wattle: An iconic Australian tree

informal relationships were probably the basis for official animal care programs, developed from the 1970s. Animals provided a refuge from the brutality of prison life and an outlet for their feelings. They also helped prisoners to understand the nature of imprisonment and how it shapes lives and emotions.

Lawrence Niewójt, in his entry, *Gadubanud society in the Otway Range, Victoria: an environmental history*, gathers together the diverse lines of inquiry pursued by archaeologists, earth scientists, ecologists, historians and geographers to gauge the scale and magnitude of past Aboriginal interventions in these forested landscapes. His interdisciplinary

approach to this area of research was highly commended by the judges.

Kylie Carman-Brown's essay, *Muck, mud and morasses: Draining wetlands in 19th century Gippsland*, discusses the role of wetlands in the hydrological landscape, the nature of threats to their integrity and the positive and negative aspects of the human-wetland interface. It then outlines colonial drainage practices, which were the principal response to the perceived negative aspects of wetlands, and the changing attitudes to these over the course of history.

The judging panel, chaired by Associate Professor Rachel Ankeny, Chair of the Academy's National Committee for History and Philosophy of Science, was impressed by the range and number of entries and the quality of the essays. They have encouraged many of the entrants, including the winners, to seek publication in various peer-reviewed journals.

The National Museum of Australia Student Prize for Australian Environmental History is awarded in alternate years with the National Museum of Australia Student Prize for History of Australian Science. Entries for the 2010 NMA Student Prize for History of Australian Science will open in September. For information and conditions of entry visit: www.science.org.au/natcoms/hps-award-has.htm. ■

2009 Theo Murphy High Flyer Think Tank

The annual High Flyers Think, sponsored by the Theo Murphy (Australia) Fund, will focus on *Agricultural productivity and climate change*. This year's two day event for early- and mid-career researchers will be held in Melbourne in late October and preparations are well under way. Think Tanks employ an issues matrix to guide discussion and the matrix for 2009 has been developed by an advisory committee comprising: Dr Michael Raupach, FAA, FTSE of CSIRO; Professor Rob Evans, FAA, FTSE of NICTA; Professor Lesley Head of the University of Wollongong; Dr John

Sims from the Department of Agriculture, Forestry and Fisheries; and Dr Michael Robinson of Land and Water Australia.

Attendees will soon be selected from amongst talented early- and mid-career researchers nominated by their institutions. The Think Tank is an exciting and vibrant event, which provides outstanding young researchers with the opportunity to establish new networks and to identify novel applications for existing science, potentially shaping the future of research in this area of national and international significance. ■

PRIMARY CONNECTIONS

The winners of the Eureka Science Prizes were announced at a gala dinner on 18 August as part of National Science Week. The Sleek Geeks Science Prize for Primary Schools went to a group of students from St Therese's School at Mascot for their video about how the heart works. Titled *Kiara's gift*, the video was inspired by Kiara Lloyd, a year 1 student with restrictive cardiomyopathy. The school's principal credits the *Primary Connections* program as the basis for its science and technology curriculum. The videos for winners and finalists can be viewed at www.abc.net.au/science/sleekgeeks/eureka/2009

International news

National Science Foundation US summer program

The Academy hosted twenty American PhD students selected to participate in the 2009 East Asia and Pacific Summer Institutes program, run by the Academy and the US National Science Foundation.

This is the sixth program held in Australia, and enables students in science and engineering to visit between June and August each year for a period of eight weeks during the northern hemisphere summer, to undertake research in laboratories and to initiate personal collaborations with their Australian counterparts.

This year's orientation session, held on 22 to 24 June, was the beginning of the students' stay in Australia. The participants come from a number of research areas, and are hosted by various institutions including universities, CSIRO divisions, museums, teaching hospitals and government institutions.

The Academy organised a series of lectures and site visits to cultural institutions as part of the orientation session. Professor Graham Farquhar FAA and Dr Sue Meek FTSE welcomed the group to the Academy during the orientation session. Professor David Lindenmayer FAA provided a comprehensive presentation on Australian biodiversity and environmental conservation issues, and Dr Joe Hlubucek, Executive Director of the Australian-American Fulbright Commission, spoke about postdoctoral research opportunities in Australia. This activity is funded by the DIISR's International Science Linkages Program.

Australia-Korea Foundation Early Career Researcher's Program

The Academy, in collaboration with ATSE, the Australia-Korea Foundation (AKF) and the National Research Foundation of Korea (NRF, previously KOSEF), ran the third AKF Early Career Researchers Program between 15 June and 14 August 2009. This program began in 2007 and is designed to enhance Australia-Korea links in science and technology.

Under this program, with funding from AKF and NRF, four young Korean scientists



American PhD students at the Shine Dome during the northern summer program



Participants of the Korean ECR Orientation session

– Dr Byoung-uhn Bae, Associate Professor Inpil Kang, Dr Soung-won Kang and Dr Young-min Woo – conducted research for two months at various Australian universities. They were hosted by Professor Jiyuan Tu (RMIT), Professor Andy Tan (Queensland University of Technology), Dr Peter Raisbeck (University of Melbourne) and Dr John Olsen (University of New South Wales), respectively.

An orientation session was held in Canberra on 15 and 16 June, and a debriefing session, attended by NRF representatives and the researcher's Korean mentors, was held in Sydney on 14 August. Mr Byung-whan Ho and Mr Won-keun Choi of the NRF met with Academy staff prior to the debriefing session.

Visit by COST Director Dr Martin Grabert

The Director of the European Cooperation in the Field of Science and Technical Research (COST) Office, Dr Martin Grabert, visited the Academy on 12 August. Dr Grabert presented a public lecture on the COST program, its role within Europe's science, research and innovation system, and its ability to act as a gateway to the European Research Area for researchers. Through DIISR funds to the Academy under the International Science Linkages program, Australian researchers have achieved one of the highest levels of success rates for applications to COST Actions from outside the European Union. More information on COST may be found at www.cost.esf.org ■

Renewable energy lecture series wraps up

(continued from page 1...)

main concentrator designs as well as outlining the history and evolution of the technologies.

He highlighted the ability to store solar thermal energy using molten salts which can keep solar plants running during the night.

He discussed the ANU's approach of building a large dish and showcased the building of the ANU's 2nd generation dish.

He said that Australia's export income must evolve from coal as the world moves to a low carbon future. He discussed the idea of exporting the sun's energy by solar gasification which can be used to create liquid hydrocarbons for export. His team has been looking at the gasification of algae and coal to produce hydrocarbons. His vision is to tap into existing infrastructure.

He discussed the benefits of Fischer-Tropsch synthesis that uses hydrogen and carbon monoxide to produce fuel. He said '...not only could we maintain our exports, but actually a liquid hydrocarbon is probably worth about three times as much per energy unit as coal is.'

Professor David Wood presented a lecture on wind energy in June. He discussed the aerodynamics and the elements that determine the efficiency of wind turbines, particularly blade design. He said the trend with wind turbines is they are getting bigger, mainly due to economies of scale. Also more turbines are being installed offshore, and these turbines are typically quite large to maximise on the higher installation and maintenance costs of locating them offshore.

His company Aerogenesis is working on small turbines to 'fill up the gaps that the big players have left behind them'. They are looking at the remote area power market, but are also looking into direct grid connection of turbines. He discussed the problem of low wind speed performance in small turbines and the computational evolution techniques they have used to improve on this. He also discussed their method of blade construction and testing.

Small turbines have urban applications such as along roadsides and around sporting grounds for direct grid connection.

Dr Wood emphasised the need for feed-in tariffs for wind energy, not just photovoltaics, in Australia. He also said tariffs need to be higher to build the initial market.



Talking turbines: David Wood during his wind energy lecture

Photo: Richard Bray

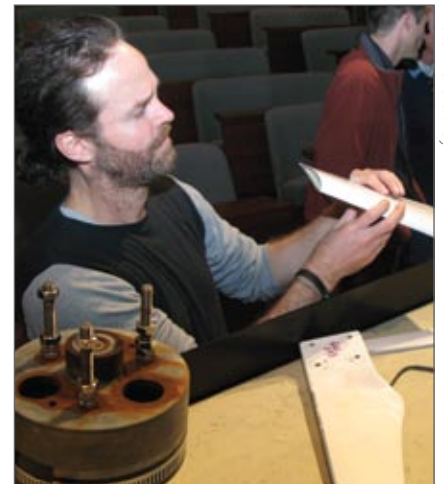
The July lecture was given by Dr Tim Finnigan from BioPower systems. He extended on the wave energy lecture previously presented in the series, with more of a focus on tidal energy.

He discussed Australia's wave energy potential saying: '...we can truly say that, in terms of wave energy, Australia has a world class resource along much of its coastline.' Wave and tidal resources are also often found near load centres and can be more predictable than wind energy. They also produce zero emissions.

He discussed the history of wave energy technologies and the difficulties of working in the ocean: 'It is a very difficult environment to work in, and a lot of partial successes met with huge failures throughout its history.'

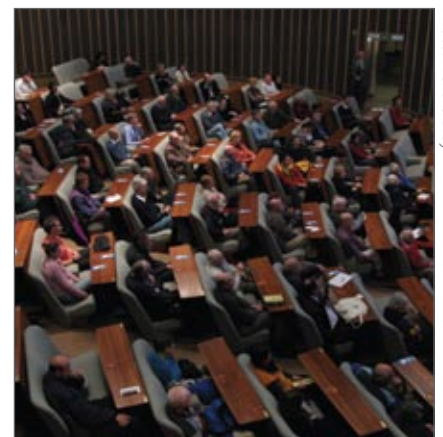
One of the issues with wave technologies is their lack of consolidation. 'There is still a whole range of different methods and we are looking for a winner or a couple of winners out of these' he said. Biopower Systems have wave and tidal energy technologies modelled on elements of nature. Pilot projects are being developed for both systems. They will need to rely on grants and feed-in tariffs initially to offset the high costs, but as costs start to come down they will be more independent.

Dr John Wright closed the series on 4 August with his lecture *The contribution of renewables in Australia's future energy mix*. He presented models of Australia's



A member of the audience comes to grips with the technology

Photo: Richard Bray



Keen interest in the series led to large audiences

Photo: Richard Bray



Photo: Richard Bray

Keith Lovegrove shares his passion for solar thermal energy

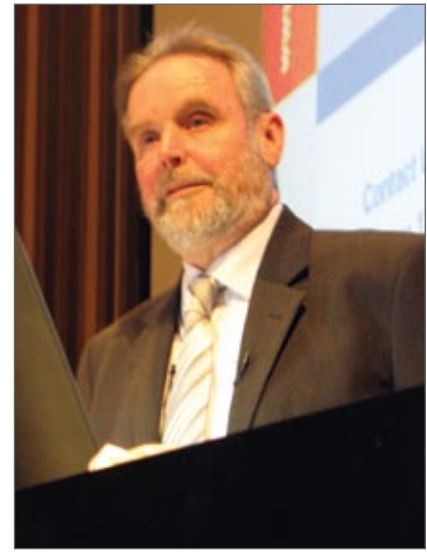


Photo: Richard Bray

John Wright wraps up the series

energy mix out to 2050. He described Australia's future energy scene as 'an extremely complex area' and said that there is no one solution to a sustainable energy future. He believes the key to the rapid take-up of renewable technologies is the smooth transition of them into the overall energy mix.

His CSIRO modelling showed the increasing expansion of renewable energies from 2010 in the overall mix, and a much smaller contribution from coal and gas carbon capture and storage. He said 'The real cost of carbon capture and storage is now starting to be understood, and it

is expensive.' He said the cost may come down eventually, but 'at the moment our understanding is that we just cannot produce our targets without a very large amount of renewable energy.'

The largest renewable contributors in his modelling were wind, solar (PV and thermal) and geothermal. He says that it's unknown how geothermal will perform, but he thinks there is a big role for it.

He finished by saying: 'There is a pivotal role for renewable energy in our future, but it cannot be considered in isolation. We have most of the parts of the jigsaw puzzle, we just need to put it together

appropriately.' He said the 'energy class wars' between renewables, coal and nuclear need to end because 'we are going to need every kilowatt that we can lay our hands on.'

'I think that we are really in a critical time in our energy planning and the decisions we make in the next few years, perhaps over the next decade, will set us on a particular path. We'd better get it right, or as right as we can, or energy sustainability will be an unreachable goal.'

The next lecture series *Water management options for urban and rural Australia* will commence on Tuesday 6 October. ■

Nanotechnology Linkage Learned Academies Special Project

The Academy has been funded by the ARC to examine the research trends, applications and collaborations of Australian nanotechnology. As an emerging and relatively contained field of research, nanotechnology provides a unique opportunity to analyse critically the research currently underway, the research of the future and the connectivity of researchers, particularly with industry. A survey open to all nanotechnology researchers was conducted to provide a clear idea of the research being undertaken in Australia and how, and with which institutions or countries, Australian researchers are collaborating. On 25 September the Academy will host

a Nanotechnology Stakeholder Day with invited representatives from universities, government science organisations, industry and government departments. Participants will discuss the issues identified from the survey as critical to nanotechnology as an emerging technology. The day will particularly focus on identifying mechanisms to improve collaboration between researchers, researchers and industry and researchers and the international nanotechnology community. The Academy's study of nanotechnology findings will be published in late 2009.

For further information, contact fiona.leves@science.org.au or call 02 6201 9461. ■

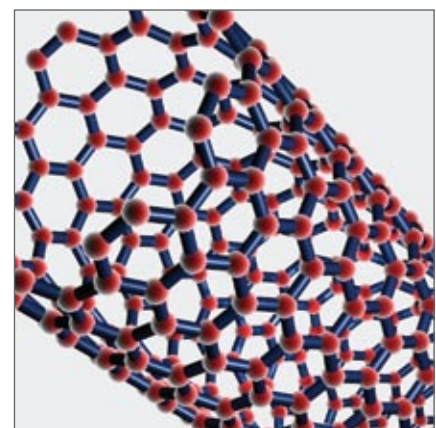


Photo: Stockxpert

Carbon nanotube structure

News from national committees

Antarctic research

The National Committee for Antarctic Research met at the Australian Antarctic Division in Hobart on 14 July. Mr John Gunn, Chief Scientist of the Australian Antarctic Division, attended as an invited guest. The committee's discussions included the Australian Antarctic Programme Science Strategy, International Polar Year, the upcoming XXXI Scientific Committee on Antarctic Research meeting from 30 July to 6 August 2010 in Buenos Aires, and the Australian collaboration with China at the Xunlun Station, Dome A.



Photo: Stockport

Antarctic research discussed by National Committee in Hobart

Astronomy

The National Committee for Astronomy (NCA) conducted a joint meeting with board members of Astronomy Australia Limited, heads of departments and the Australian Gemini Steering Committee during the annual scientific meeting of the Astronomical Society of Australia in Melbourne from 5 to 9 July. Topics discussed included the future of the Anglo-Australian Observatory, the International Gemini Agreement and a mid-term review of the Astronomy Decadal Plan. The next meeting of the NCA is planned for 2 December at Ian Potter House.



Speakers at the National Committee for Nutrition's symposium - *Salt in the diet*. Back row L to R: Bruce Neal, Russell Keast, Susan Anderson, Stewart Truswell, Geoffrey Annison. Front row L to R: Jennie Brand-Miller, Jennifer Keogh, Jacqui Webster, Kay Gibbons, Robyn Speerin

Earth science

The National Committee for Earth Science met at Ian Potter House on 16 June. The main focus of this meeting was a mid-term review of the 2003 National Strategic Plan for the Geosciences. The next meeting of the committee is to be held at Ian Potter House on 1 December.

Earth system science

The National Committee for Earth System Science met at Ian Potter House on 17 June. The main focus of this meeting was the preparation of a Decadal Strategic Plan for Earth System Science. A consultation workshop will be held in September with an invited representational reference group to evaluate a concept document that has been prepared by the committee.

Nutrition

The National Committee for Nutrition (NCN) met on 1 June at Urrbrae House at the University of Adelaide. Topics of discussion included the upcoming General Assembly of the International Union of Nutritional Sciences in Bangkok from 4 to 9 October,

and a nutrition leadership program aimed at providing support and direction for mid-career researchers. The next meeting of the NCN is planned during the joint Nutrition Society of Australia and New Zealand Nutrition Society meeting in Newcastle from 8 to 11 December.

The NCN, in conjunction with The George Institute for International Health and the Nutrition Society of Australia and sponsored by the Academy, held a symposium, *Salt in the diet: the elephant in the room: why health professionals need a shake up*, and a public lecture, *Should you be eating that much S**T (salt)?*, on 13 August in Sydney. The symposium was attended by nearly 70 representatives from the food and health industries, academia and government. A wide range of topics was discussed including appropriate labelling for salt on food packaging, the impact salt

has on health, regulation of salt in food and how to reduce salt in the diet.

Medicine

The National Committee for Medicine met by teleconference on 5 August. The focus of the discussions was the National Health and Medical Research Council Strategic Plan. The committee plans to meet in October to further discuss NHMRC issues.

Plant and animal sciences

The National Committee for Plant and Animal Sciences met by teleconference on 1 July. Topics of discussion included the upcoming General Assembly of the International Union of Biological Sciences in Cape Town, from 9 to 13 October and the annual meeting of the American Society of Plant Biologists in Hawaii from 18 to 22 July. ■

Interviews with Australian scientists

Four interviews have been posted on the *Interviews with Australian scientists* section of the Academy's website (www.science.org.au/scientists). Interview transcripts, teachers notes and DVDs are now available for Academy Fellows Professors Ray Martin, Bruce Holloway, John Swan and Ron Brown.

Ron Brown worked in many areas of chemistry including spectroscopy, theoretical chemistry, astronomy, molecules and life in space. This diversity of interests began as a young boy when he borrowed a book about astronomy from his school library! Professor Brown went on to have a wonderfully rich and diverse career, receiving many accolades and holding the position of foundation professor of chemistry at Monash University from 1959 until his retirement in 1992. Sadly, Ron Brown died only a few months after the filming of his interview.

As a young boy Bruce Holloway enjoyed performing biological experiments even before he knew this was what he was doing. His inquisitive nature led him into a long and distinguished career as a geneticist. Chief among many positions he has held, Bruce was appointed foundation professor and department head of genetics at Monash University in 1968. He served the university in these dual roles for 25 years.

John Swan has had a wonderfully diverse career in chemistry from researching wool protein to contributing to the synthesis of the peptide hormone, oxytocin. John spent nearly twenty years at Monash University where he served as professor of organic chemistry, pro vice-chancellor of the university and dean of the faculty of science. Professor Swan has also campaigned for many years for the preservation of marine environments around Victoria.

Ray Martin had a strong family background in science and his interest in it



John Swan and Ron Brown

Photo: Maggie Percival



Bruce Holloway and Ray Martin

Photo: Maggie Percival

was innate from an early age. He decided that one physicist in the family, his father, was enough, and so started on a long and rewarding path of a career as an inorganic chemist. During his career in chemistry he

has been a foundation professor of inorganic chemistry at the Australian National University and vice-chancellor of Monash University.

All four interviews were generously sponsored by Monash University. ■

HANS BUCHDAHL TURNS 90

Happy birthday to Hans Buchdahl (FAA, 1968), who turns 90 on 7 September. Professor Buchdahl was born in Germany and educated at Imperial College in London. He was later awarded a DSc by the Universities of London and Tasmania.

He came to Australia as a refugee from Europe and obtained a position as

lecturer in the Physics Department at the University of Tasmania, where he stayed for 20 years, rising through senior lecturer to reader. Hans was then appointed Professor of Theoretical Physics, Faculty of Science, Australian National University in 1962. He retired in 1984, remaining at the University as a University Fellow and later Visiting Fellow.

His first book, *Optical aberration coefficients*, presented ideas and results that have been applied in computer lens design programs world-wide. In fact, much of what he has

accomplished in optics has become part of the professional tool-kit of optical engineers and optical physicists. He also published in such diverse fields as general relativity theory, tensor and spinor analysis and the foundations of classical thermodynamics.

Hans has received a number of awards, including the Academy's Thomas Ranken Lyle Medal (1972) and the AE Conrady Award of the International Society for Optical Engineering (1997).

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). The following extracts provide a preview.

Hunting for dark energy with the WiggleZ

Mysterious dark energy is thought to make up a large part of our universe. But what is dark energy and how will the WiggleZ help us understand it?

Here is an astonishing thought. Astronomers are telling us that nearly all of the universe in which we live is invisible. This invisible, 'dark' part of our universe doesn't seem to emit any light or radiation. Only about five percent of the universe is in the form of glowing galaxies, stars, clouds of gas and dust, and planets. That five percent includes us.

According to an increasingly popular theory, most of the dark universe is made up of mysterious stuff called dark energy (most of the rest is dark matter). Australian astronomers are among the leaders in the race to understand it. In fact, they were at the forefront in producing evidence that it exists at all. Now, using advanced equipment attached to the Anglo-Australian Telescope at Siding Spring Mountain in New South Wales, they are in the midst of a project to measure it.

The WiggleZ project

To show that astronomers have a sense of humour, they have called their project WiggleZ, which sounds like the name of the four guys in the coloured skivvies. There the similarity ends. The 'Z' represents a way of measuring how far away galaxies are, and the 'wiggle' the astronomers are looking for is the memento of sound waves that bounced around the early universe.

The WiggleZ project will hunt for some pattern in the way galactic structures are distributed. By comparing pictures of the early universe with much more recent images they hope to measure the amount of dark energy.

This topic is sponsored by The University of Queensland School of Mathematics and Physics and Swinburne University of Technology Centre for Astrophysics and Supercomputing under an ARC Discovery Project grant.

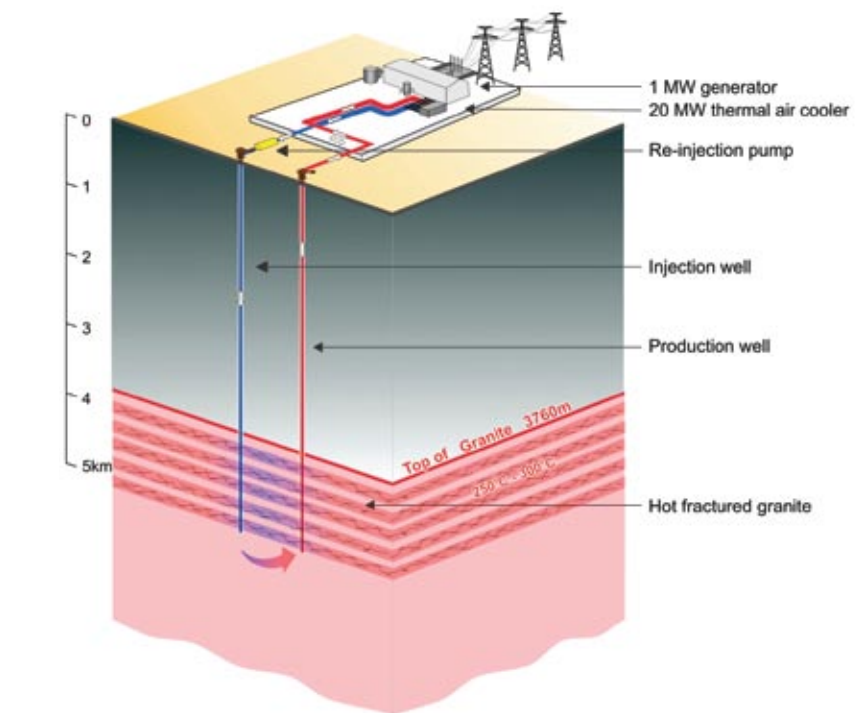


Image: Geodynamics Limited

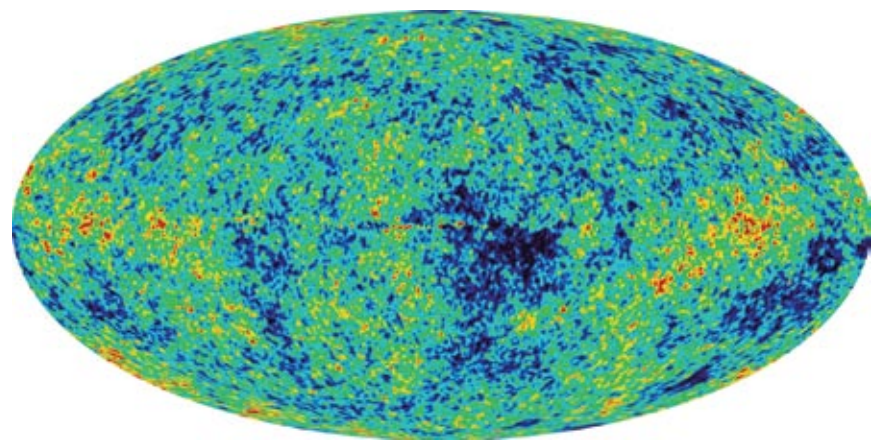


Image: NASA/WMAP Science Team

Top: Water is pumped underground at high pressure to create a reservoir in a hot rock geothermal system
Above: The 'hot' and 'cold' spots in the cosmic microwave background correspond to today's galaxies

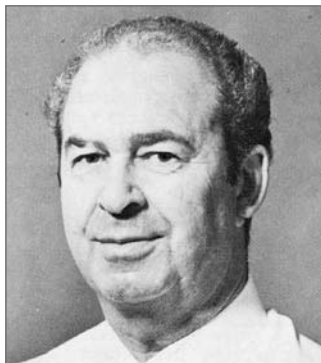
Rocking on with hot rocks geothermal energy

Geothermal energy is a clean, green resource with the potential to power Australia for centuries.

The world is getting hotter. This is because of the increasing concentration of greenhouse gases in the atmosphere,

due mainly to our excessive burning of fossil fuels. The resulting greenhouse gases trap radiation from the Sun causing the planet's temperature to rise. But not all of Earth's heat comes from the Sun; some of it is underground and rather than causing global warming it could help to wean us off fossil fuels.

Mel Thompson



Mel Thompson

Arthur Melville ('Mel') Thompson was born in Adelaide on 4 January 1917 and died in Sydney on 8 August 2009. After graduating with honours in physics from the University of Adelaide, he joined the CSIRO National Standards Laboratory. He spent the whole of his working life there, retiring in 1982 from his position as a Chief Research Scientist in the Division of Applied Physics, as the laboratory was then

known. His retirement marked the end of an era for the laboratory, as he was the last of the nine scientists of whom it was originally constituted. After his retirement he continued his work for a time as an Honorary Senior Research Fellow.

Thompson's major contribution was to the precise measurement of physical quantities, particularly electrical, which formed the basis of a revolution in accurate measurement all over the world. In 1956 he and DG Lampard (later FAA) produced a new theorem in electrostatics which allowed the electrical capacitance of a four-cylinder system to be calculated in absolute terms from a single measurement of length, made by interferometry with great precision. This formed the basis for the design and construction of the Lampard-Thompson capacitor, which was universally accepted as the most accurate method for realising the farad and the ohm absolutely. This and his development of three-terminal capacitors and alternating current bridges incorporating ratio

transformers enabled him to relate the 'ohm' to absolute measurements of length and time accurately and simply. His suggestion to use capacitance probes for sensing displacement and the commercial development of his alternating current bridge greatly increased the accuracies obtainable over a wide range of physics research, for example with geophysical tiltmeters, magnetostriction, thermal expansion and pressure gauges.

Mel was elected to the Fellowship of the Academy in 1972 and received many awards including the Instrument Society of America's Albert F Sperry Medal with Doug Lampard in 1965, an honorary Doctorate of Engineering by the University of Hanover in 1968, and the IEEE Morris E Leeds Award in 1977 'for outstanding advances in absolute electrical measurements, particularly capacitance and resistance'. In 2003 he received a Centenary of Federation Medal.

He is survived by his wife Joan and his children Marc and Haydn. ■

This heat, geothermal energy, lies in abundance beneath our feet. If the energy stored in hot rocks inside the Earth could be tapped and used instead of fossil fuels, it could help to reduce the threat of climate change. Geothermal enthusiasts talk about an 'almost limitless' supply of energy. The challenge is tapping into it in a cost-effective way.

What is geothermal energy?

The deeper you go into the Earth the hotter it gets. Part of the heat is left over from the creation of the Earth, which started off as a hot cloud of gas and dust and has been cooling over time. Geothermal energy has an even more important source: radioactive decay. The continual creation of new heat by radioactive decay and the flow of heat from Earth's core towards the surface are reasons geothermal energy is considered a renewable resource.

Using geothermal energy

Geothermal resources vary in character and in the ways in which they can be used. High temperature geothermal systems can be used for electricity generation,

cooler systems can be used for direct-use applications, and shallow ground source heat pumps can be used in a wide variety of locations.

Globally the main accessible resources are in hydrothermal and hot rock systems. Hot rocks are the most abundant geothermal resource in Australia and hold promise as a major contributor to Australia's future energy supplies. But Australia's resources are only now starting to be understood. Despite the need for more data, it is clear that Australia has massive geothermal resources.

This topic is sponsored by the Australian Geothermal Energy Association and the Australian Government Department of Resources, Energy and Tourism.

Information on both these topics is available on the Australian Academy of Science's *Nova: Science in the news* website at www.science.org.au/nova. A glossary, student activities, further reading and annotated links to relevant websites are also available.

The Australian Foundation for Science is a supporter of *Nova*. ■

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 **30 October 2009** travel in 2010.

Further information is available from www.science.org.au/internat/berry

Research update: Conservation of endangered Australian vertebrates

Habitat use of the endangered spotted-tailed quoll (*Dasyurus maculatus*) and its interactions with wild dogs

Edited from a report by Gerhard Körtner, Zoology, University of New England

This study, sponsored in part by the Academy's Award for research on the conservation of endangered Australian vertebrate species, monitored the movement patterns of spotted-tailed quolls, to determine their home range size and habitat utilisation. The size and turnover of the quoll population in Tuggolo State Forest (SF), near Walcha in New South Wales, has been monitored via capture-mark-recapture since 2004.

The quoll population in the Tuggolo SF is at a low level with few adult males being available for collaring. Last year a number of adult females entered the population and the most recent trapping revealed an increased number of sub-adults hopefully marking a turning point in the population's downward trend. In March 2008 four adult males were collared and all collars were retrieved. The home range of these four males overlapped only marginally, suggesting some territoriality at least at low population densities. Until now only females were assumed to defend territories.

In October and November 2008 another four males were captured and fitted with GPS collars. One of these was a recapture from the first study. To date, only three of the four males have been recaptured, with one requiring five weeks of intensive searching. One collar had malfunctioned, and the intermittently received radio-signal for the one missing male indicates a location at the bottom of a 400 metre deep gorge that is too dangerous to access.

Nevertheless, data from the two working collars retrieved so far have supplied excellent results. The higher sampling frequency of the new collars shed some light on the daily movement patterns. The two males travelled on average an accumulated distance of 2.5 and 3.1 kilometres per night, with a maximum 6.9 kilometres.

The time the two animals spent active in the open, rather than resting in a den, was also measured. The two animals measured in summer were more nocturnal than

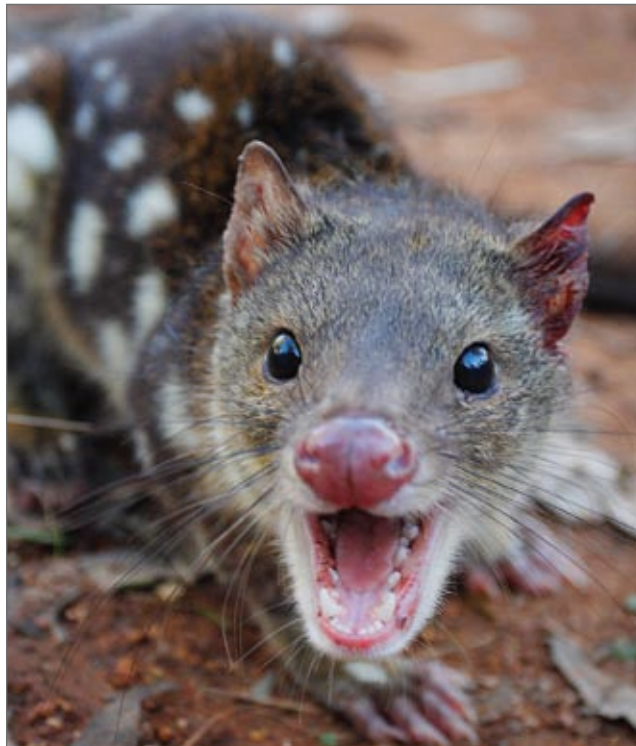


Photo: Gerhard Körtner

Tracking collars are giving new insights into the life of quolls

those measured in autumn, although some daytime activity still occurred.

The home range size appears to be similar between summer and autumn. The animal measured in both summer and autumn remained in the same area and shifted its home range little between the two seasons. There was little overlap between the home range of the two animals measured in summer.

One animal remained in a relatively small area (one square kilometre) for about two weeks, before resuming normal movement patterns with constantly shifting locations. It transpired that a 'mini-tornado' had killed a number of cattle in this area: presumably the quoll scavenged on the carcasses. The same animal also visited a campground on one of the creeks repeatedly. Evidently quolls scavenge when the opportunity arises.

Currently, two more males with GPS collars are scheduled for recapture and hopefully the collars can be retrieved. One of the males is again a recapture and might allow another long-term comparison in home range size and location. Based on the success of this project, Glen Innes area of the Department of Environment and Climate Change has purchased three smaller collars to fit on female quolls. A

project tracking both male and females, either in Tuggolo SF or Guy Fawkes National Park, is planned.

Data on home range and habitat use will be compared with that of competing introduced predators such as wild dogs, cats and foxes that co-inhabit the study area. The movement patterns of all species are to be primarily determined by the use of GPS collars and to a minor extent by radio-tracking, remote cameras, track pads and trapping. The first collars have been retrieved from dogs in Tuggolo SF and slowly a more detailed picture of the movement of wild dogs is emerging. In addition, researchers for the Victorian Arthur Rylah Institute have deployed five cat collars and these should add information on another competing predator. Finally, NSW Department of Primary Industries is planning a GPS-collar project on foxes in Tuggolo SF for the second half of this year, which would round up one of the most comprehensive studies on predator movement in Australia to date.

The Award for research on the conservation of endangered vertebrate species is generously funded by an anonymous donor. Information about the award is available from www.science.org.au/awards/conservation ■