



2010 UK–Australia Frontiers of Science: Marine Science Meeting

Photo: Fiona Leves



Participants at Frontiers of Science meeting in Perth



Photo: Justin Parker

Ningaloo Reef, Western Australia

Oceans are a source of food and resources, control global weather patterns, are home to some of the most diverse ecosystems on the planet and are an integral part of many societies. It is therefore little wonder that the Australian Academy of Science and UK Royal Society selected marine science as the theme for their first joint *Frontiers of Science* meeting.

The 2010 *Theo Murphy Frontiers of Science* meeting was held in Perth, Western Australia as part of worldwide celebrations to mark the UK Royal Society's 350th anniversary. The meeting brought together 70 early and mid career researchers from the UK and Australia for five days from 9 to 13 October to discuss cutting edge marine science.

Marine researchers work on topics as diverse as the bacterial flora of reef sponges to the deep ocean currents of Antarctica. *Frontiers of Science* meetings provide

participants with the unique opportunity to network and discuss research from across a broad range of physical and biological sciences; researchers who do not traditionally have the chance to meet at discipline specific meetings.

As the sun set over the Indian Ocean on Saturday 9 October, the 70 researchers were welcomed to Perth and the meeting by the Academy's President, Professor Suzanne Cory AC PresAA FRS, and the Royal Society's Vice-President and Foreign Secretary, Professor Lorna Casselton FRS.

Proceedings got into full swing the next day when the *Frontiers of Science* meeting was formally opened by the Western Australian Chief Scientist, Professor Lyn Beazley AO. Over the next two and half days, 24 delegates explained what they do and why. The talks were organised as a series of themed sessions, including marine ecosystems,

marine biogeochemical cycles, carbon sequestration in the ocean and ocean acidification. Consequently, topics ranged from polar to tropical locations, the seafloor to surface waters, the geological past to the present day, applying modelling, field work and management perspectives.

The most commonly used word during the discussions at the meeting, with considerable justification, was 'complex!' The world's oceans are a series of complex systems that can no longer be studied in isolation.

Participants appreciated coming together to increase their awareness of the interconnectedness of their research and the potential for future collaboration.

Detailed information on the program is available at www.science.org.au/events/frontiers/frontiers2010/index.html

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GPO Box 783
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www.science.org.au

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

Email: aas@science.org.au

Honorary editor:
Professor Neville Fletcher AM FAA

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Honours to Fellows



Photo: The Bionic Ear Institute

Graeme Clark

Professor Graeme Clark AC FAA was awarded The Lister Medal by the Royal College of Surgeons of England.

Professor Hugh Durrant-Whyte FAA was named NSW Scientist of the Year for 2010.

Professor Leslie Field FAA was awarded the 2010 Leighton Memorial Medal from the Royal Australian Chemical Institute.

Professor Peter Hall FAA was awarded the 2010 George Szekeres Medal presented by the Australian Mathematical Society.



Doug Hilton

Dr Doug Hilton FAA was elected as a Fellow to the Australian Academy of Technological Sciences and Engineering.

Professor John Shine AO FAA was awarded the Prime Minister's Prize for Science.

Professor Stephen Simpson FAA was awarded the Wigglesworth Award for 2012 by the Royal Entomological Society.

Corresponding member, **Professor Bertil Andersson FAA** was awarded the 2010 Wilhelm Exner Medal.

Important dates

Australian Water Reform – The Murray-Darling Basin Plan

Public lecture in the water series
by Professor Barry Hart, Shine Dome,
7 December 2010

First Australian Earth System Outlook Conference

Shine Dome,
Canberra, 9–10 December 2010



Captain James Cook 1775–76
by Nathaniel Dance, National Maritime
Museum, Greenwich, London

EXPLORATION AND ENDEAVOUR: THE ROYAL SOCIETY OF LONDON AND THE SOUTH SEAS

Celebrating the 350th anniversary of the Royal Society, this exhibition brings together unique treasures associated with voyages of scientific discovery to the South Seas. See navigational instruments from the Endeavour and Resolution, and letters from James Cook and Matthew Flinders. Discover the key role the Royal Society has played in Australia's history.

On show until 6 February 2011
Only at the National Museum of Australia
Free admission

www.nma.gov.au

Discovery of a new human ancestor

Professor Paul Dirks, Head of the School of Earth and Environmental Sciences at James Cook University, Townsville, presented a public lecture at the Shine Dome on the discovery of a new human ancestor, *Australopithecus sediba* on 23 September. Those attending were privileged to see a display of the full cast of its fossilised skeleton for the first time in Australia. The lecture attracted over 180 people and intense media coverage.

The discovery of *A. sediba* was made by Professor Dirks and Professor Lee Berger from the University of the Witwatersrand. The fossil site, called Malapa, is near Johannesburg, South Africa and is part of the 'Cradle of Humankind', a UNESCO world heritage site. The first hominid specimen from Malapa was discovered by Professor Berger's nine year old son on 15 August 2008. To date more than 130 fossil elements of a previously unknown human ancestor have been found making this one of the richest fossil hominid sites ever discovered. Partial skeletons of an adult female and a young boy were dated to 1.9 million years ago using faunal dating, radiometric dating and paleomagnetic dating. More than 200

animal remains of 25 different species were also collected with the hominid fossils.

The *A. sediba* skeletons cannot be accommodated within existing fossil taxa. The combination of primitive and derived characteristics of the cranium and postcranium suggest that it may represent an evolutionary transitional form. The age

and overall morphology of *A. sediba* implies that it most likely descended from *A. africanus*, but the overall body plan is more like the genus *Homo*. The evidence collected to date suggests that *A. sediba* represents a candidate ancestor for the genus *Homo*. ▲

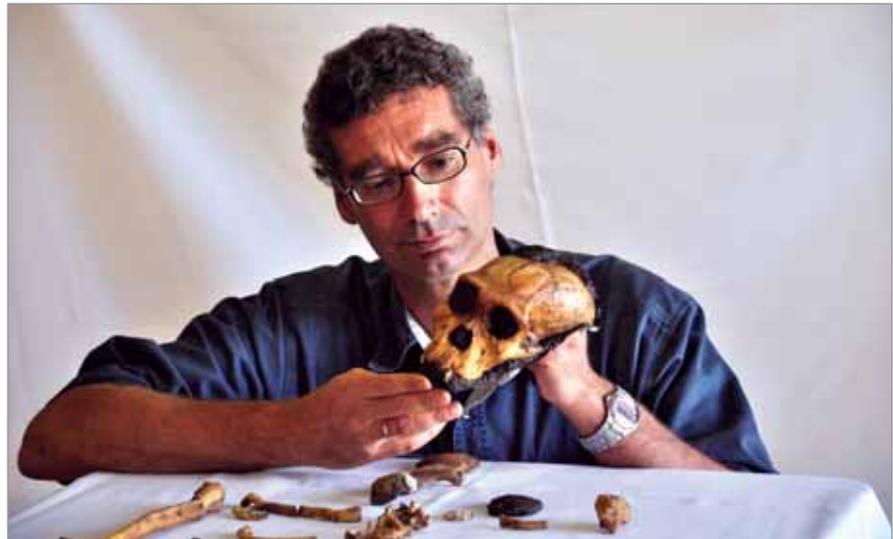


Photo: Mona Akbari

Paul Dirks examines the cast of the *Australopithecus sediba* skeleton

Prime Minister's Prize for Science

The Academy is delighted that Professor John Shine AO FAA, Director of the Garvan Institute in Sydney, has won the 2010 Prime Minister's Prize for Science. As part of the award, he received a solid gold medallion and a \$300,000 cash prize for his scientific discoveries and research leadership.

While at the Australian National University in the 1970s, Shine discovered the DNA sequence, now known as the Shine-Dalgarno sequence, which directs bacteria to start making a protein. Subsequently, in San Francisco, he and his colleagues developed procedures for cloning and expressing human genes in bacteria, thereby enabling mass production of vital proteins such as insulin and growth factor.

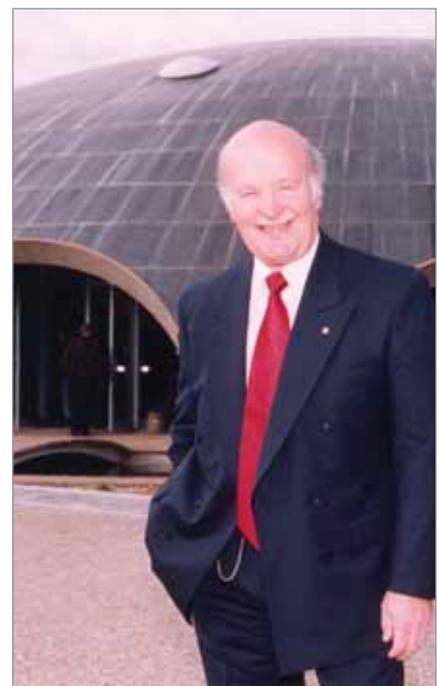
Professor Suzanne Cory AC PresAA said 'The award of the 2010 Prime Minister's

Science Prize to Professor John Shine is richly deserved. His pioneering contributions to recombinant DNA science helped launch the biotechnology revolution that has driven unprecedented advances in the life sciences and transformed medicine and agriculture.'

In 2000, Professor Shine donated \$1 million towards the refurbishment of the Academy's iconic building, which was renamed the 'Shine Dome' in his honour.

Professor Shine will continue his research using neural stem cells from the nose to explore potential treatments for hearing loss, Alzheimer's, Parkinson's and other diseases.

Further information is available from www.science.org.au/news/ ▲



John Shine in front of the Shine Dome

International news

Review of the International Science Linkages program

A review of the International Science Linkages Program (ISL) of the Australian Government Department of Innovation, Industry, Science and Research (DIISR), is currently underway. The ISL program was established in 2004 as an extension of the former Innovation Access Program – International Science and Technology. The key aims and objectives of the ISL program are to increase the uptake of leading edge science and technology and facilitate Australia's access to the global science and technology system by supporting bilateral and multilateral relations with other countries.

The ISL program has allocated approximately \$10 million per annum across five components:

- competitive funding which includes competitive grants, the Australia–China Special Fund for Science and Technology Cooperation and the French–Australian Science and Technology program
- strategic policy
- the Australia–Europe Research Collaboration Fund
- the Science Academies program
- the Humanities, Arts and Social Science Academies program.

The ISL program comes to an end in 2011. Feedback from funding recipients has indicated that it has been a critical instrument for Australian researchers to obtain international funding and access new knowledge and technologies. Individual researchers have achieved a widening of perspectives, opportunities and experience as well as strengthening linkages and establishment of long term collaborations, an involvement in large international projects and programs, and the promotion of Australian science. The Academy strongly supports the continuation of the ISL program.

FASAS Council meeting in Seoul, 2010

The Federation of Asian Scientific Academies and Societies (FASAS) held its 2010 Council meeting in Seoul, Korea, on Thursday 21 October. The meeting was hosted by the Korean Academy of Science

and Technology (KAST) as part of an annual series of events which included the General Assembly meeting of the Association of Academies of Science in Asia (AASA) and an AASA–FASAS Joint International Conference. In 2010 the conference focused on *Science Education in Asia and the Pacific*. The program of events lasted from 18 to 22 October and was held at the Hotel Kyo-yuk Mun-hwa Hoekwan. A program of site visits to industry and research organisations was also organised by KAST.

The Australian Academy of Science was represented by Professor Kurt Lambeck AO FAA and Ms Nancy Pritchard, Manager of International Programs. Professor Lambeck is serving as FASAS President for the term 2010–12, during which time the Academy is acting as the secretariat of FASAS. Discussions at the meeting focused on the future directions of FASAS and other Asian groupings of science.

Visits to Japan and Korea

While in Seoul, Nancy Pritchard, met with the newly formed National Research Foundation of Korea (NRF). NRF will take on the activities previously undertaken by the Korean Science and Engineering Foundation with which the Academy has had a memorandum of understanding since 1992, for an exchange of scientists.

Nancy also met with the Japan Society for the Promotion of Science (JSPS) on 15 October in Tokyo to discuss the bilateral exchange programs between the Academy and JSPS. These programs have been in place since 1977.

JSPS Short-term, Long-term and Postdoctoral Fellowships

The Australian Academy of Science, in association with the Japan Society for the Promotion of Science (JSPS), invites applications from Australian researchers to undertake Invitational and Postdoctoral Fellowships in Japan. Invitational Fellowships are either short-term (14 to 60 days) or long-term (2 to 10 months).

Researchers in any field of natural sciences, including technology, engineering and medicine may apply. Applications

in the humanities and social sciences are also accepted for the Postdoctoral Fellowships only.

Closing date for submissions is Friday 14 January 2011. More information is available from www.science.org.au/internat/asia/index.html

Grants for International Travel to Japan

The Academy invites applications from professional scientists to collaborate with researchers in research institutions in Japan between 1 April 2011 and 31 August 2011.

The closing date for applications is Friday 14 January 2011.

More information is available from www.science.org.au/internat/asia/japan.html

COST Action Funding

The Australian Academy of Science has received funding of \$195,000 from DIISR to deliver the project – Australian participation in European Cooperation in the field of Scientific and Technical Research (COST).

Australian researchers travelling to Europe may receive a grant in aid of up to A\$5,000 to undertake a Short-Term Scientific Mission (STSM) of COST and/or attend a workshop/meeting of COST.

Applications are assessed on a first come, first served basis. Applicants must be a member of a COST Action prior to applying for funding from the Academy. More information is available from www.science.org.au/internat/europe/cost.html

Australia–Germany Researcher Mobility Call

The Academy is managing a one-off call for applications with Germany on behalf of DIISR. The Academy received 67 applications for the Australia–Germany Researcher Mobility Call. After approval by DIISR and the German Federal Ministry of Education and Research, 14 successful applicants were selected to receive funding. For a list of successful applicants please visit www.science.org.au/internat/europe/mobility-participants-2010-11.html

Australia–China collaboration

Thirty years of scientific cooperation between Australia and China was celebrated by a week long visit in November from the President of the Chinese Academy of Sciences, Professor Yongxiang Lu FAA, and several other senior representatives of their Academy. Professor Lu was the guest of honour at a public lecture and celebration dinner at the Shine Dome co-hosted by President of the Academy Professor Suzanne Cory, and Senator the Honourable Kim Carr, Minister for Industry, Innovation, Science and Research.

Professor Lu's lecture entitled *Science and technology for a green, smart and sustainable future* highlighted China's appreciation of the valuable contribution that science and technology can make in addressing the global challenges of a changing world.

Professor Lu's schedule of engagements included the *Australia–China workshop on Agriculture and Food Security Relating to Health* in South Australia. During his time



Photo: Irene Dowdy

Yongxiang Lu and Kim Carr enjoy dinner at the Shine Dome

in Canberra, Professor Lu attended the award ceremony for the Prime Minister's Prizes for Science as the Prime Minister's guest at Parliament House and met with the Foreign Minister, the Honourable

Kevin Rudd. He also signed memoranda of understanding with the Universities of Adelaide and Sydney and visited the CSIRO's Division of Food and Nutritional Sciences. ▲

2010 Douglas Scholarship winner



Asha Bowen

Dr Asha Bowen, an infectious diseases paediatrician who has recently commenced a PhD at Menzies School of Health Research in Darwin, has been awarded the 2010 Douglas and Lola Douglas Scholarship in Medical Science. This scholarship has been made possible through a bequest from the estate of Miss Lola Douglas and allows the Academy to fulfil one of Miss Douglas' great wishes – to support young researchers.

Dr Bowen is conducting a randomised controlled trial comparing two different short course oral antibiotics for the treatment of impetigo – a highly contagious bacterial skin infection – with the current standard of care intramuscular benzathine penicillin G. Dr Bowen is treating children from several remote Aboriginal communities in the Northern Territory who are participating in the trial. Asha's other research interests include respiratory infections and HIV in children.

News from national committees

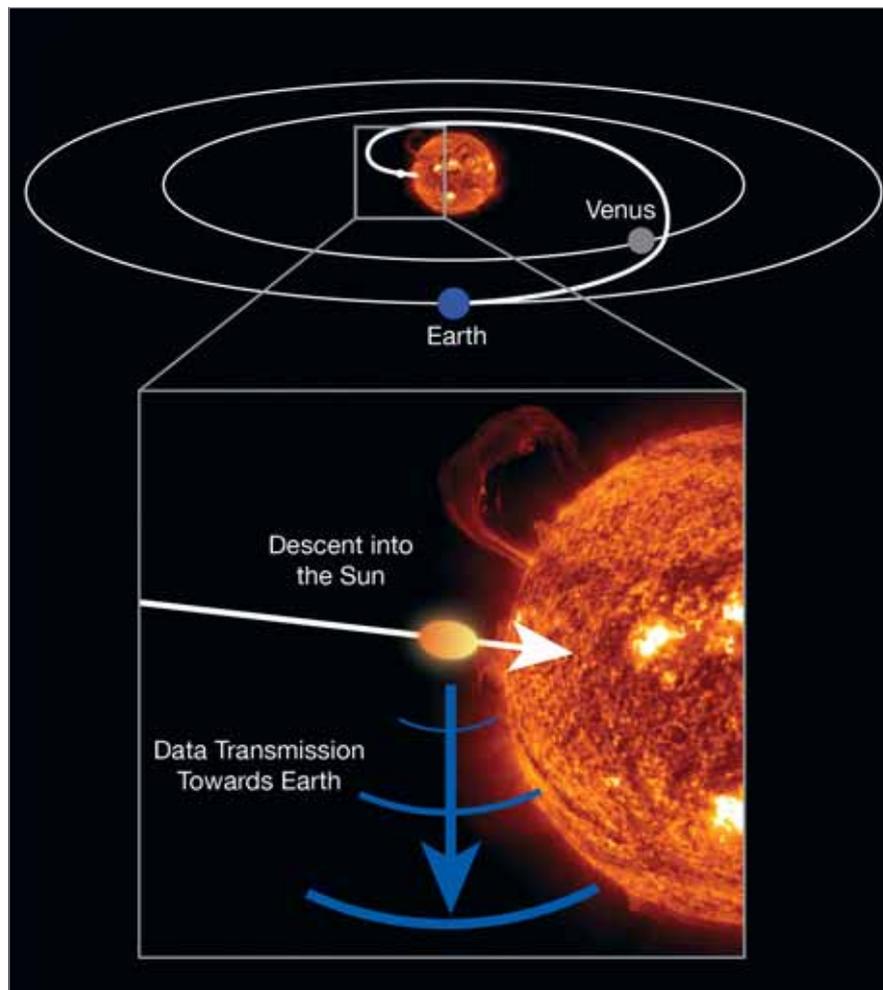
Space science

The *Decadal Plan for Australian Space Science – Building a National Presence in Space* was launched by Professor Margaret Sheil, Chief Executive Officer, Australian Research Council during the 10th Australian Space Science Conference in Brisbane on 27 September.

The plan's vision is to build a long-term, productive presence in space for Australia via world leading innovative space science and technology, strong education and outreach, and international collaborations. Specifically, the plan recommends a number of initiatives including:

- **SpaceShip Australis** – a state-of-the-art network to measure, model and predict space weather from the Sun to the ground and support the proposed Square Kilometre Array.
- **Marabibi Constellation** – a flexible program of low-cost satellites that link SpaceShip Australis and provide student focused research on space weather, technology and the Earth.
- **Sundiver** – a spacecraft that will dive into the Sun to answer fundamental questions on the Sun's supersonic wind and hot corona.
- **Hypersonic flight**

The plan received widespread media coverage across television, radio and print media. The plan is available from www.science.org.au/natcoms/nc-space/documents/nc-space-decadal-plan.pdf



Schematic of the Flagship project Sundiver

Illustration: Hugonnet Design Associates

Earth system science

The National Committee for Earth System Science has completed a strategic plan – *To live within Earth's limits* – an Australian plan to develop a science of the whole Earth system. The document has been endorsed by the Academy's Executive Committee and is being prepared for publication. It will be launched by the Chief Scientist at the First Australian Earth System Outlook Conference at the Shine Dome from 9 to 10 December 2010.

Further information about the conference is available from www.science.org.au/events/conferences-and-workshops/earth-system-outlook/index.html

Crystallography

The National Committee for Crystallography has made two nominations for positions on the International Union for Crystallography (IUCr) Executive Committee, and 11 nominations for membership of IUCr commissions.

Plant and animal sciences

The National Committee for Plant and Animal Sciences met at Ian Potter House on 10 September 2010. Discussions included the International Union of Biological Sciences activities and the *Productivity*

Commission Inquiry into Rural Research and Development Corporations Model. The committee has provided a submission to the inquiry and will be involved in preparing a response to the draft report.

Astronomy

The National Committee for Astronomy (NCA) will hold town hall meetings in November as part of the mid term review of the document *New Horizons: A decadal plan for Australian astronomy (2006–2015)*. The Chair of the NCA, Professor Elaine Sadler FAA, addressed the Annual General Meeting of Astronomy Australia Ltd on 8 November. The plan is available from www.atnf.csiro.au/nca/DecadalPlan_web.pdf

ICSU coordination

The Chair of the new National Committee for ICSU Coordination, Professor Bruce McKellar FAA, convened the first meeting of the committee on 3 September at the University of Melbourne. The members of the committee are Professors Jenny Graves AO FAA, Cheryl Praeger AM FAA, David Vaux FAA and Dr John Zillman AO FAA.

The committee will:

- advise the Academy Council, through the Foreign Secretary, on the interaction between ICSU and the Academy and on ways to strengthen that interaction
- provide advice on material received from ICSU requiring a response from the Academy
- gather information about Australian representatives to the ICSU General Assembly and have discussions with these representatives as appropriate.

10th meeting of the ICSU regional committee for Asia and the Pacific (RCAP)

The ICSU RCAP met at the Shine Dome on 11 and 12 November. This is the first time that this committee has met in Australia. RCAP met with a number of Canberra based scientists, members of the Academy Executive, Professor Deliang Chen, Executive Director for ICSU and Professor Penny Sackett, Chief Scientist for Australia, to discuss ICSU activities, sustainability science, and health and wellbeing in the changing urban environment.

Further information about the ICSU RCAP and the activities of the ICSU Regional Office for Asia and the Pacific can be found at www.icsu-asia-pacific.org/

Geography

The National Committee for Geography met on 1 November. The committee considered the Australian curriculum for geography and associated skills and learning outcomes. They also discussed the production of a book in conjunction with the International Geographical Union. The book will be the outcome of the project – *Strengthening the bonds between scientific*

literacy and human understanding: Local area networks to help build cross-border solutions for disaster management. The meeting also focused on future activities for the committee.

On 2 November, the National Committee for Geography held a Strategic Directions for Geography 2010 think tank. This think tank considered the need for a strategic planning document for geography. The group recognised that there was a need to identify goals and priorities for the discipline for the coming decade, and that involvement in this process from all sectors of the discipline was necessary.

Physics

The first meeting of the Working Group Committee for the *Investing in the future of Physics* project was held in Melbourne on 6 November. The working group discussed the budget, terms of reference and vision for the document. Initial planning was also done for four concurrent town hall meetings which will be held by the Australian Institute of Physics on 7 December.

Biomedical sciences

The National Committee for Biomedical Sciences met at the University of New South Wales on 15 October. The committee's current areas of focus include development of a National Forum on Education in Biomedical Sciences expected to take place at the end of 2011, support for young researchers in Australia and the Asia-Pacific region and improved cooperation between the various Australian biomedical societies.

Nutrition

The National Committee for Nutrition is holding *Nutrition Adelaide 2020* in conjunction with the University of Adelaide Foodplus Research Centre on 9 and 10 December 2010. The workshop will involve key international and national opinion leaders in the areas of nutritional science, agriculture (plant and animal breeding, plant and animal nutrition), food science, food manufacture and health. The workshop aims to identify the gaps in nutrition research between sustainable

agriculture and health outcomes over the next decade. Outcomes from this workshop are expected to provide a basis for a decadal plan for nutrition.

History and philosophy of science

Nominations are now open for the 2011 National Museum of Australia Student Prize for History of Australian Science or Australian Environmental History. The prize will be awarded for an essay based on original unpublished research undertaken whilst enrolled as a postgraduate or undergraduate student at any tertiary educational institution. More information on the prize is available from www.science.org.au/natcoms/nc-hps/nc-hps-award-ae.html

Chairs meeting

The annual meeting of Chairs of National Committees for Science was held on 22 September in the Shine Dome. This year the meeting presented an opportunity for Chairs to meet the new President. Each Chair presented a brief summary of their present and planned activities, including progress with projects funded under the Academy's new National Committee initiatives funding stream. The future funding of decadal plans was an item of concern, due to the change in funding rules for ARC Learned Academy Special Project grants. The National Committees for Earth Sciences, Mathematical Sciences, Astronomy, Space Science, Physics and Earth System Science all reported on completion, mid term review, implementation, ongoing areas of concern, or commencement of discipline reviews or strategic plans.

2011 Lindau meeting

The Academy's nominations for the 61st Meeting of Nobel Laureates in Lindau, Germany have been submitted to the Lindau Council. The meeting will be held from 26 June to 1 July 2011 and is dedicated to Medicine and/or Physiology. Information on the Lindau meetings is available from www.lindau-nobel.org/

Nova: Science in the news

The following topics have been posted on the Academy's education website, *Nova: Science in the news* (www.science.org.au/nova):

Geoengineering: can it help our planet keep its cool?

Global warming has become such an important issue that some climate experts are proposing technology to pull accumulated greenhouse gas from the air or shield the planet from the sun's rays. This branch of science, known as geoengineering, applies technology on a massive scale to bring about changes to the Earth's environment. At the moment, many of the proposals are hypothetical and risky, but some scientists think we might be forced to consider them if greenhouse gas emissions cannot be controlled in other ways.

Two broad groups of geoengineering technology exist: carbon dioxide removal and solar radiation management.

Carbon dioxide removal

The ocean fertilisation strategy involves seeding the ocean with iron to encourage marine algal blooms, increasing carbon

dioxide uptake through their photosynthesis. The likely success of this is unknown – a recent Atlantic Ocean study did not give support to the technique, but a dust storm that dumped thousand of tonnes of nutrient rich topsoil into Sydney Harbour triggered a huge algal bloom. Around eight million tonnes of carbon dioxide was captured – equivalent to a month's emissions from a coal-fired power station. Whether this removal was permanent or temporary remains unresolved.

Plants take in large amounts of carbon dioxide through the process of photosynthesis, so more plants and less land clearing mean less carbon dioxide. The challenge is that many billions more plants would be needed to make a real difference, and the establishment of plantations may be limited by climate, soils and competing land uses.

When plants die and decompose much of their accumulated carbon is released to the atmosphere. Through pyrolysis, crop and forestry wastes could be converted into a type of charcoal called 'biochar'. Ploughing this into the ground improves the soil and – as it is resistant to microbial decomposition, effectively locks away the carbon for thousands of years. But pyrolysis requires energy, and biochar would need to be produced on a global scale to make substantial differences to carbon levels.

Solar radiation management (SRM)

The 'cool roof' strategy involves replacing dark roofs and pavements with light ones, causing more sunlight to be reflected into space. This is a low cost solution that should also reduce cooling costs for homeowners, but hundreds of millions of homes would need to participate for any noticeable effect.

The low level clouds scenario involves deploying fleets of custom-built ships to send vaporised seawater into the lower atmosphere. Proponents expect that more clouds would form, especially over the oceans, reflecting sunlight back into space. However this technology would only remain effective whilst the technology was in operation.

Aerosols could be injected into the stratosphere to imitate the impact of volcanic eruptions by placing chemical compounds, such as sulfates, into the atmosphere. There they would block light arriving from the sun. The challenges include not only how to inject millions of tonnes of aerosols at high altitudes, but also how to maintain levels as they fell under gravity. Also needed would be a greater understanding of the potentially far-reaching impacts of stratospheric aerosols.

Still more spectacular technologically, would be to rocket many millions of thin reflecting disks into Earth's orbit to dim incoming sunlight. This could be done quite quickly, but at great cost and with unknown effects upon climate and agriculture in different regions.

All avenues at once?

Geoengineering offers a variety of ways to reduce global warming but each option brings with it substantial legal, ethical and economic issues and challenges. The uncertainties surrounding it suggest that whilst the technology should be developed as a future safeguard, the number one priority still needs to be reducing the production of greenhouse gas emissions that are central to the global warming problem.

This topic is sponsored by the Australian Government Department of Climate Change and Energy Efficiency.

Illustration: Lawrence Livermore National Laboratory



Geoengineering schemes deliberately alter the Earth's climate. Key: **a** aerosols in stratosphere; **b** iron fertilisation of sea; **c** giant reflectors in orbit; **d** chemicals to save ozone; **e** grow trees; **f** cloud seeding; **g** genetically engineered crops; **h** greening deserts; **i** pump liquid CO₂ into deep sea; **j** pump liquid CO₂ into rocks

Bioinformatics: making sense of the information flood

Since the completion of the Human Genome Project, scientists have been inundated by biological information. Bioinformatics is helping to make sense of it all.

Bioinformatics involves the application of information technology, mathematics and statistics to biological problems and draws together a range of professions – mathematicians and information scientists working in close collaboration with biologists and biomedical scientists. It is a rapidly evolving tool that is proving useful in agriculture, medicine and evolutionary biology.

Mapping DNA and proteins

To be sequenced, a genome needs to be broken into pieces. One task of bioinformatics is to put all the sequences back together and 'map' the DNA and determine the order in which the bases occur and the chromosomes to which they belong. To add to the complexity of the system, the same stretch of DNA can code for different proteins. The daunting task of mapping DNA and proteins can be helped by bioinformatics, as not only is the number of potential proteins large but protein expression also varies in the body in response to factors such as age, health and diet.

Comparing sequences

Studies of the human genome have indicated the importance of minor variations in genes between individuals. Even differences in a single base or nucleotide may increase the susceptibility of a person to a particular disease.

One of the opportunities offered by the growing pool of molecular maps is the ability to compare the genetic make-up of individuals and species and to correlate differences in them with health disorders. This could lead to improved treatments such as new drugs, or changes in diet that are tailored to suit specific genetic profiles.

Predicting proteins and integrating information

Scientists at the Australian National University used bioinformatics tools



Photo: Assoc. Prof G Shaw, ARC Centre of Excellence in Kangaroo Genomics, Zoology Dept, Uni Melb.

The genome of the Tamar Wallaby (*Macropus eugenii*) was the first representative of the Kangaroo family to be mapped and is now providing valuable information for further genetic studies

to scan the genomes of a range of species for genes similar to the human PRion (PRNP) gene. This gene codes for the production of prion proteins which have important cellular functions but in certain circumstances can become dangerous, causing diseases such as Creutzfeld-Jacob or 'mad cow' disease. Scientists have discovered another gene that encodes the Shadoo Protein, SPRN. It is similar to PRNP and occurs in a range of species. When this protein disappears, it's a sign that prions are replicating. Investigations are now under way to determine the exact role of SPRN in the hope of shedding light on prion diseases.

Evolutionary biology

Studies of the platypus and kangaroo genomes have also yielded intriguing results. The platypus diverged from other mammals about 166 million years ago, and the kangaroo diverged about 148 million years ago. Comparisons between the modern day genomes of these species and the genomes of other modern mammals, such as humans, are providing new genetic insights that can be applied across a range of species. Kangaroo genomics, for example, helped in the

identification of the gene SRY, which determines the sex of mammals. It has also led to developments in theories of how 'globins' or proteins in the blood form.

Risk and reward

Despite the extraordinary potential of bioinformatics it also comes with issues, including the need to protect the privacy of individuals and reliance on regular information technology updates. Yet the power of bioinformatics is enabling scientists to rise above the information flood and will undoubtedly lead to major advances in medicine, agriculture and our understanding of living things.

This topic is sponsored by the Australian Research Council Centre of Excellence in Bioinformatics.

More information on both of 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 for each topic.

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

Interviews with Australian scientists

The focus for the *Interviews* program in October was on chemists, with the filming of interviews with Professor Nick Hoogenraad in Melbourne and Professor Andrew Cole FAA in Perth. Professor Hoogenraad is currently Head of the Department of Biochemistry at La Trobe University, where he investigates the machinery used to import proteins into the mitochondria – the energy generating compartment of the cell. Professor Cole was Head of the Department of Physical and Organic Chemistry at the University of Western Australia where he developed and utilised infra-red spectroscopy. These interviews were kindly sponsored by La Trobe University and the University of Western Australia, respectively.

One of the purposes of the *Interviews with Australian Scientists* project is to dispel the 'geeky' caricature version of scientists, as seen by the general public. The interviews with Professors Cole and Hoogenraad will certainly help us to achieve this goal. Between them, these athletic chemists participate in a diverse range of sports, including running, hiking, sailing, cricket, hockey and golf! As well as sports, both Professors are passionate about education and have initiated projects to engage secondary students in science, with great success.



Photo: Cecily Oakley

In October, Nick Hoogenraad (left) was interviewed by David Vaux (right) about his career in biochemistry, and his sporting and viticultural pursuits

Look out for the transcripts from these interviews in the coming months to read more about their lives and their science. In the meantime, transcripts of interviews with other fascinating scientists are now available on the Academy website. Recent postings include Dr William Blevin

AM FAA, Professor Robin Stokes FAA and Dr Nicole Webster, winner of the 2010 Dorothy Hill Award. Interview transcripts with Dr Oliver Mayo FAA, Professor John Newton FAA and Dr Amanda Barnard, winner of the 2010 Frederick White prize will follow shortly. ▲

Science by Doing – the end of trialling

Photo: Science by Doing



School children engaged in an inquiry-based science lesson

October 14th saw the conclusion of the *Science by Doing* Stage One trial with a final workshop for the 28 schools involved. The science coordinators from each school travelled to Canberra to spend a day of reflection with us in the Shine Dome. The purpose of the day was twofold. Firstly, coordinators had several opportunities to report on their own experiences during the trial. Secondly, coordinators were called upon to provide advice about how the *Science by Doing* professional learning approach could be improved. A sense of goodwill and positive encouragement characterised the day.

Professor Leonie Rennie of Curtin University was present at the workshop. She is conducting an independent evaluation of *Science by Doing*.

Primary Connections

ACT Professional Learning Facilitator workshop

The *Primary Connections* team, led by Louise Rostron, *Primary Connections* Professional Learning Consultant, trained another cohort of 51 professional learning facilitators at University House, Canberra during the three day workshop from 11 to 13 October. All states except the Northern Territory were represented at the workshop. Professor Jenny Graves AO FAA, Secretary for Education and Public Awareness at the Academy, welcomed participants and Shelley Peers, *Primary Connections* Project Director, outlined the importance of the professional learning consultant role.

ACT Curriculum Leader workshop

On 15 and 16 October, the ACT Department of Education and Training hosted the second of two *Primary Connections* Curriculum Leader workshops for 2010. Some 45 enthusiastic participants from both the Government and Catholic education sectors took part, providing very positive feedback about their experiences. This was especially significant as one of the two days was a Saturday!

The ACT now has over 60 Curriculum Leaders who will lead the implementation of *Primary Connections* in their schools and participate in a newly formed online network. In addition, a newly trained Professional Learning Facilitator, Sharon Fellows has joined the central office to assist Curriculum Leaders and teachers to support the implementation of *Primary Connections* in ACT Government schools.

Unit Distribution figures

Approximately 54 per cent of primary schools across Australia now have at least one *Primary Connections* curriculum unit. This figure includes 59 per cent of state schools, 41 per cent of Catholic schools and 39 per cent of Independent schools. A total of 292,748 units have now been distributed to Australian schools. ▲



Louise Rostron, Jenny Graves, Shelley Peers and Carole Jaye

Photo: Primary Connections

An esteemed science education academic, Professor Rennie co-authored the 2001 landmark research report *The Status and Quality of Teaching and Learning of Science in Australian Schools* for the then Federal Department of Education, Training and Youth Affairs. The focus of the evaluation for *Science by Doing* will be the professional learning approach (PLA). At its core our PLA recognises that teachers themselves are the key to change. The PLA was described at length in the previous issue of this publication and information can be found at www.science.org.au/sciencebydoing

Professor Rennie's evaluation includes pre- and post-trial research tools, and site visits to a representative sample of schools during Term 3. Professor Rennie also

attended and reported on the initial workshop with school coordinators in April 2010. Her final evaluation report is expected before the end of the year.

The Academy's commitment to independent evaluation of its programs has achieved widespread admiration, endorsement and even envy at international forums on science education, including from Chile, France, UK, Finland, Iran and Argentina! It is perceived that the evaluations provide rigour and weight and, as such, set *Science by Doing* and *Primary Connections* apart from many other high profile initiatives from around the world.

With the completion of the trial the activities of the *Science by Doing* team will focus on the revision of the curriculum

and professional learning resources. Quantitative data from written evaluations and qualitative data recorded during our visits to schools will influence the revision process. Final editions of the three curriculum resources and the five professional learning resources will be released during the first half of 2011. ▲



Research updates

Phylogeography and conservation biology of the Purple-crowned Fairy-wren

Edited from a progress report
by Anja Skroblin and Sarah Legge

The distribution of the Purple-crowned Fairy-wren (PCFW) extends more than 1500 km across the wet-dry tropics of

Photo: D. Adams, Australian Wildlife Conservancy



Purple-crowned Fairy-wren

northern Australia, but is restricted to the naturally patchy vegetation fringing the widely spaced rivers of the region. This vegetation is being degraded over large parts of the tropics by intense fires, cattle, and weed invasion. As a result, PCFWs have disappeared from some areas and the western subspecies is now listed as 'vulnerable' under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999*.

By improving our understanding of how naturally patchily-distributed species persist and respond to habitat degradation and fragmentation, the project will help conserve the PCFW and other species that are distributed unevenly, whether naturally or as a result of habitat loss.

A combination of population genetics and phylogeographic analysis was used to clarify subspecies divergence results based on morphological variation. Targeted surveys have been conducted across

14 catchments and fine scale and landscape scale habitat predictors. PCFW populations most in need of conservation intervention have been identified.

The study challenges the notion that PCFWs are a highly sedentary species with limited dispersal capability. Rather than requiring continuous corridors of habitat, persistence of the PCFW is dependent on many habitat patches being retained between catchments to serve as territories and 'stepping' stones to move across the landscape. The results of this study will form a crucial baseline from which to monitor future species population trends and plan regional scale environmental management.

The genetics component of this research was funded by the 2009 Margaret Middleton Fund for the Conservation of Endangered Australian vertebrate species. More information about this fund is available from www.science.org.au/awards/awards/conservation.html

Epizootiology of a myxozoan parasite in the endangered Green and Golden Bell Frog

Edited from a progress report by
Dr Jan Šlapeta, University of Sydney

The presence of an unknown parasite, now confirmed as myxozoan parasite, in a Green and Golden Bell Frog (*Litoria aurea*) population in 2008 prompted an investigation into its impacts on the population ecology, individual health and the significance of the infection to the species.

The initial investigation focused on the endangered Green and Golden Bell Frog which was originally found with the unknown parasite. Further opportunistic sampling and collaboration with the Australian Registry of Wildlife Health has led to the identification of identical organisms in free ranging Striped Marsh Frogs (*Limnodynastes peronii*), Peron's Tree Frog (*Litoria peronii*), Booroolong Frogs (*Litoria booroolongensis*), a captive population of Southern Bell Frogs (*Litoria*

raniformis) and Cane Toads from the southern front of NSW. The potential for other critically endangered populations to be impacted upon by these pathogens is high. These parasites cause significant disease to amphibians and could be a conservation concern especially in captive, stressed populations. Research is still continuing to determine the life cycle of these parasites in frogs and to develop management strategies to interrupt the life cycle of the parasite.

The findings from this research formed the foundation for an Australian Research Council Discovery Project application (pending 2010). This research was funded in part by the 2009 Margaret Middleton Fund for the Conservation of Endangered Australian vertebrate species. More information about this fund is available from www.science.org.au/awards/awards/conservation.html

INSPIRING AUSTRALIA

Inspiring Australia is a national strategy for engagement with the sciences, developed in collaboration with the Australian Government, scientists, teachers, journalists and other science communicators.

The *Inspiring Australia* strategy was released in February 2010. The broad outcomes and recommendations of the report will be used to drive a national coordinated approach to communicate science and develop a scientifically engaged Australia.

For more information visit www.innovation.gov.au/inspiringaustralia or to subscribe to the newsletter please contact inspiring.australia@innovation.gov.au

2010 Ian Wark Medal and Lecture

The 2010 Ian Wark Medal was presented to Professor Aibing Yu at a dinner held at the Scientia Building at the University of New South Wales on 10 August.

The Ian Wark Medal and Lecture award recognises outstanding research which advances scientific knowledge and/or its application and contributes to the prosperity of Australia. The award honours the contribution to Australian research of the late Sir Ian Wark, a chemist who was Chief of the CSIRO Division of Industrial Chemistry.

Professor Yu is Federation Fellow and Scientia Professor in the School of Materials Science and Engineering, University of New South Wales. Professor Yu's outstanding, world-class research in the field of particle or powder technology, especially particle packing, particulate and multiphase processing, and the simulation/modelling of particulate systems, has greatly expanded the scientific knowledge base and has been extensively applied. His work has led to significant economic benefits in the mineral, metallurgical, chemical and material industries, most notably steel and coal, and his impact will continue to benefit Australian industry in the future.

Professor Yu's work has been recognised with many prestigious awards and professorships and in 2004 he was elected to the fellowship of the Australian Academy of Technological Sciences and Engineering.



Rudi Lemberg Fellow

The 2010 Rudi Lemberg Fellow, Professor Johann Deisenhofer, Regental Professor and Professor in Biochemistry at the University of Texas Southwestern Medical Center, presented a range of lectures and seminars in Brisbane, Canberra, Sydney and Melbourne during September.

Professor Deisenhofer is an eminent structural biologist and 1988 Nobel Laureate in Chemistry, a prize he was awarded jointly with Robert Huber and Hartmut Michel for the determination

of the three-dimensional structure of a photosynthetic reaction centre'. His major research interests are protein crystallography, structure and function of biological macromolecules, and computational biology. He has made outstanding contributions to understanding the structural basis of action in a number of systems relevant to a broad range of researchers, not only structural biologists but biologists, chemists and physicists working in many different

fields from immunology to plant science.

The topic of one of his lectures, *Structural Biology: Challenges and Prospects*, looked at the importance of structural biology to all aspects of biological research since the 1950s and highlighted the advances made and the continuing need to 'push the boundaries'. During his tour, Professor Deisenhofer also placed an emphasis on providing opportunities for informal meetings with junior researchers and students. ▲

Fellow turns 90

The Academy sends warm wishes to Professor Ken Le Couteur FAA, who turned 90 on 16 September. Ken was born in Jersey, Channel Islands and educated at the University of Cambridge obtaining his PhD in 1949. He was a Fellow of St John's College, Cambridge from 1945 to 1948 and of Manchester University from 1948 to 1949, before moving to Liverpool University in 1949 as a senior lecturer.

In 1956 he was appointed professor of theoretical physics at the Australian National University, and he retired from there as an Emeritus Professor in 1986. Ken was elected as a Fellow of the Academy in 1960 and received a Centenary Medal from the Australian Government in 2003.

Ken's main work was on the synchrocyclotron, a device that

accelerates subatomic particles to high energies. Ken says that his main contribution was called 'the regenerative method' which found a way of getting the beam out of the cyclotron for external experiments. The method was adopted by the European Council for Nuclear Research. He later also worked on plasma physics theory. ▲

Obituaries



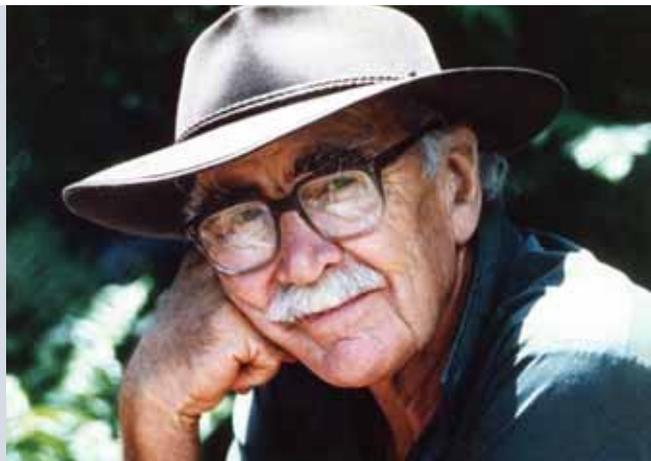
Lawrie Lyons

Lawrie Lyons

Lawrence Ernest Lyons was born in Sydney on 26 May 1922 and died in Brisbane on 14 October 2010. He was educated at the University of Sydney, receiving a BSc in 1943, a BA and MSc in 1948 and at the University of London where he obtained his PhD in 1952 and DSc in 1964. After war service in the RAAF he joined the University of Sydney in 1945 and moved through the ranks of lecturer, senior lecturer and reader in physical chemistry. In 1963 he became the first professor of physical chemistry at the University of Queensland, a position he held until his retirement in 1987, when he had the title of Professor Emeritus conferred on him. He was head of the Department of Chemistry from 1970 to 1973.

His early work was concerned with ultra-violet spectroscopy of aromatic molecules and the polarography of heterocycles. Measurement and interpretation of the spectroscopic behaviours of aromatic and other conjugated molecules, particularly in crystalline form, has since developed into a major field of activity. From these studies of crystal spectra a natural development was into semi- and photo-conductivity of organic crystals. His later research was in the area of thin-film solar cells, using a coating of cadmium telluride.

Professor Lyons was an active member of a number of professional associations and a Fellow of the Royal Australian Chemical Institute. He was a member of the editorial board for *Molecular Crystals and Liquid Crystals* from 1966 to 1983 and of



John Sprent

Chemical Physics Letters from 1967 to 1977. Together with his wife Alison he was a driving force in the New University Colleges Council, a body whose vision was to build new residential colleges at Australian universities. He had a lifelong interest in the interaction of science and theology and in 1989 he founded ISCAST, the Institute for the Study of Christianity in an Age of Science and Technology.

Awards and honours included a Liversidge Scholarship in 1939 for top marks in chemistry in NSW, a Liversidge Lectureship, Royal Society of NSW in 1966 and a Liversidge Lectureship, ANZAAS in 1976. He also won the Walter Burfitt Prize, Royal Society of NSW, and the HG Smith Medal, Royal Australian Chemical Institute, both in 1968. He was elected to the Fellowship of the Australian Academy of Science in 1971 and served on a number of Academy Committees, including one which produced a report, *Solar Energy Research in Australia*, in 1973. The Australian Government awarded him a Centenary of Federation Medal in 2003.

Lawrie is survived by his wife Alison and his son Andrew. His other son, Hugh, predeceased him.

John Sprent

John Frederick Adrian Sprent was born in London on 23 July 1915 and died in Brisbane on 1 November 2010. He was educated at the University of London, receiving a BSc (hons) in 1943, a PhD in 1945 and a DSc in 1953. He began his

professional career as a veterinary research officer for the Colonial Veterinary Service in Nigeria from 1942 to 1944, before returning to England to the Ministry of Agriculture Veterinary Laboratories from 1945 to 1946. He then moved to the University of Chicago until 1948, funded by first a Cooper Centenary Research Fellowship and then a Seymour Coman Research Fellowship in Preventive Medicine. His next four years were spent as a senior research fellow at the Ontario Research Foundation. In 1952 he moved to Australia to take up a position of senior lecturer in veterinary parasitology at the University of Queensland. In 1954 he became research professor of parasitology and in 1956 professor of parasitology, a position he held until his retirement in 1983 as Emeritus Professor. He also served as Dean of the Faculty of Veterinary Science from 1963 to 1969.

His area of specialisation was parasitology in the biological sciences, veterinary sciences, and medical and health sciences. His work also included the field of pathology as well as detailed classical studies on taxonomy, life cycles, zoogeography and evolution of parasites, particularly the ascaridoid nematodes.

His awards and honours include the Payne Exhibition, University of Melbourne in 1961, Henry Baldwin Ward Award, American Society of Parasitologists in 1962, election to the Fellowship of the Australian Academy of Science in 1964, Mueller Medal, Australian and New Zealand Association for the Advancement of Science in 1981, and World Federation of Parasitologists Distinguished Parasitologist Award 2010.

He became a Commander (Civil) of the British Empire in 1984.

Professor Sprent was a member of a number of professional bodies, being particularly involved in the Australian Society for Parasitology, of which he was the founding president. In 1983 the society established the John Frederick Adrian Sprent Prize in his honour. He was also Editor in Chief of the *International Journal for Parasitology* from 1974 to 1993 and a special edition, *The Rise and Decline of Animal Parasites* was published when he stepped down from this position.

He also showed his commitment to the wider community by being the first person to sign up his property to the Land for Wildlife in Queensland nature conservation scheme.

His wife of 61 years, Muriel, predeceased him, as did his daughter Elizabeth. He is survived by his second wife, Mary, and his two sons, Jonathan and Anthony. 

2010 Selby Fellowship

The 2010 Selby Fellow, Professor Peter Sadler FRS, Professor of Chemistry at the University of Warwick, visited Australia during August and September and presented 11 public lectures in Brisbane, Sydney, Wollongong and Melbourne on *The elements of life and medicines*. He also presented specialist lectures for researchers in the fields of medicinal organic chemistry and biological magnetic resonance spectroscopy, and his visit provided an opportunity to bring together Australian researchers in the area of metals in biology for an inaugural meeting.

Professor Sadler is an eminent international authority in the field of bioinorganic chemistry and in particular, medicinal inorganic chemistry, where he has made major contributions to understanding the mode of action of a particular class of anti-cancer drugs, as well as in the design and patenting of a range of new metal-containing drugs.

The Selby Fellowship is generously supported by the Selby Scientific Foundation and is presented annually. Fellowships are awarded to distinguished overseas scientists to visit Australia to give public lectures and seminars and to visit scientific centres in Australia.

The 2010 Lloyd Rees Memorial Lecture

The 10th Lloyd Rees Lecture was delivered in Melbourne on 23 September 2010 by Dr Steve Wilkins, a Chief Research Scientist in CSIRO. The Rees Lectures are given by scientists who have made distinguished contributions to chemical physics in Australia.

Dr Wilkins' talk on *Riding the X-Ray Wave – Some Personal Reflections* first briefly outlined his early work on the development of novel methods of X-ray structure determination based on information theory. The work led to a paper in *Acta Crystallographica A* in 1993, in which the problem of X-ray structure determination via the 'maximum entropy' method was formulated.

Dr Wilkins described how the multipurpose powder diffractometer called 'BigDiff' was built at CSIRO in Clayton under his guidance. It was installed in 1992 and continues to operate fruitfully, allowing Australian scientists to 'cut their teeth' by building and operating synchrotron related instrumentation.

Dr Wilkins went on to talk about his group's contributions to the development of hard X-ray phase contrast imaging which represents a new paradigm for radiography.



Photo: Peter Hannaford

(Left–right) Peter Hannaford, Steve Wilkins, Linda Wilkins and Tony Klein (Chair, Victorian Fellows) after the 2010 Lloyd Rees Lecture

He noted that this development has helped open up a wide range of opportunities for new instruments and applications that span the fields of medicine, industry and research.

The full version of this article is available from www.science.org.au/news

Shine Dome Open Day



Emeritus Professor Ken Campbell explaining the Dorothy Hill items on display



Questacon's Dr Scar



Shine Dome tour in the Ian Wark Lecture Theatre

On 25 September the doors to the Shine Dome were opened to the public once again. This year the focus of the day was celebrating women in science. *L'Oréal Australia: For Women in Science* awardee Dr Rowena Martin gave an engaging short lecture about drug resistance in the human malarial parasite. Professor Marilyn Ball FAA gave a talk about the paradoxical response of plants to climate change, that was also well received. Audience members were surprised and intrigued to learn that there is evidence for an increase in frost damage in warming climates!

In partnership with the University of Queensland and the Queensland Museum, the Academy was able to display artefacts from the life and scientific career of past President Professor Dorothy Hill AC CBE FAA. Items on display included her field kit, fossilised coral samples and school book prize. Dorothy Hill's former PhD student, Emeritus Professor Ken Campbell FAA, was also on hand to share his memories of Professor Hill. *L'Oréal* also provided displays, books and information on its *L'Oréal Australia*

and *L'Oréal-UNESCO For Women in Science* awards. Two short films from the Academy's *Interviews with Australian Scientists* collection were also shown. These films profiled early career scientists and 2010 Academy honorific award winners Dr Amanda Barnard and Dr Nicole Webster.

Also speaking on the day was the Academy's 2010 Mawson Medal winner, Professor Patrick De Deckker AM, with his lecture entitled *Understanding Canberra's dust storms*. This was another timely and interesting talk prompting many thoughtful questions from the audience.

The children's program for the day was very popular, with many excited little people with black eyes and bullet wounds running around the Shine Dome looking for answers to the treasure hunt. At first, the number of wounded children was worrying, but it soon became clear that Dr Scar was responsible. With the aid of silicon putty and a make-up kit, Questacon's Dr Scar visited the Shine Dome to teach children and brave adults about the science of wounds and healing. Academy education

programs *Primary Connections* and *Science by Doing* set up displays in the Fellows room where they were inundated with visitors until closing. Not difficult to imagine with experiments like tea bag rockets, paper boat building and bubble making.

The grey day did not hamper the crowd, with over 250 people visiting during Open Day. Many visitors took part in one of the four guided tours of the Shine Dome offered throughout the day. These popular tours took in the gardens, moat, Ian Wark Theatre, Jaeger and Becker rooms and the Basser library. Guides included architects John Armes and David Hobbes, and Academy librarian Rosanne Walker, giving each tour a different flavour and focus. 'My highlight from Open Day was viewing this very unusual and efficient building and seeing inside the hall', stated one interested visitor. Another keen visitor praised 'the staff's enthusiasm and simplistic explanations to questions'. Riding on the recent success of Open Day 2010 the Academy is already planning exciting themes and activities for 2011! ▲