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Think Tank explores biotech and agriculture

The Academy held its 4th High Flyers Think Tank on 26 July at the Shine Dome in Canberra. Entitled *Biotechnology and the future of Australian agriculture*, the Think Tank was supported by Biotechnology Australia and the Department of Agriculture, Forestry and Fisheries. The purpose of the Think Tank series is to bring together early- and mid-career researchers from a broad range of disciplines to engage in thinking about novel applications of existing science and technology and to identify gaps in knowledge that might be addressed when applying science (including social science) and technology to a particular issue. It is well recognised that interdisciplinary and transdisciplinary approaches to problem-solving enable more diverse and lateral thinking, and therefore more comprehensive outcomes. The High Flyers Think Tanks are also seen by the Academy as a unique opportunity for career development and network creation among the nation's next generation of researchers and their institutions, in an independent setting.

The Think Tank gained considerable interest, with some 75 high flyers and 30 senior experts representing the full gamut of research and government agencies, from each state and territory. The format focused on five key areas of agriculture: horticulture, crops, livestock, aquaculture and 'pharming' (eg, neutraceuticals, new products, etc.) and the day's brainstorming sessions were prefaced by a series of presentations from eminent experts that helped to set the scene. In addition to presentations on the five focus areas, these talks included overviews on emerging technologies in biotechnology by Dr Alan Finkel, biotechnology research and development by Dr Ian Edwards, and the social context of biotechnology by Biotechnology Australia's Craig Cormick. Academy President Dr Jim Peacock facilitated the day's proceedings.

For each of the key area breakout group discussions, the high flyers were charged with considering how biotechnology relates to their sectoral-based aspects of productivity, environment, the value chain and social/ethical concerns. Many of the participants



Dr Jim Peacock (front right) with some of the Think Tank speakers and session chairs. Back row (from left): Professor Bernard Degnan, Dr Peter Willadsen, Dr Alan Finkel, Dr Steve Swain, Dr Sue Forrest. Front row (from left): Dr Jeff Ellis, Dr Ian Edwards, Craig Cormick, Dr Allan Green.

commented on the unique opportunity the Think Tank provided by exposing them to biotechnology considerations of all agricultural sectors. Many were also surprised at the degree of common issues across all sectors (universalities) and appreciated a deeper understanding of the sector-specific aspects. Biotechnology was likened to the next information technology revolution, with a multitude of possibilities and applications to enhance not only agriculture but quality-of-life into the 21st century. Delegates felt it important to ensure the big-picture context for biotechnology as an entire area of science with many varying applications, not just those related to gene transfer (transgenics). Concomitantly, one of the most resounding outcomes was the critical need for communication,

education and engagement of the community – and the likely role for scientists in these areas.

The Think Tank proceedings, including a summary report and recommendations, will be available on the Academy website by the end of August (the program is at www.science.org.au/events/biotechnology). Outcomes are expected to inform government and the research community on the current status of (and future strategic directions for) biotechnology and the broader agricultural sector in Australia. Many of the participants attended Dr Jim Peacock's televised address, *Tomorrow's agriculture – we need to work things out!*, held at the National Press Club the next day. A transcript of the address is at www.science.org.au/events/npc2005.htm.

2005 Frontiers of Science

The Academy's 2005 Frontiers of Science, the second in the series of this prestigious event, was held on 12–13 April at the Walter and Eliza Hall Institute of Medical Research in Melbourne. The symposium, hosted by Academy President Dr Jim Peacock, is designed to bring together some of Australia's best young scientists to showcase emerging science and technology, highlight new opportunities, and share cutting-edge advances.

This year's event was highly

successful in terms of the program, with 16 speakers in eight sessions discussing the latest research in photonics, molecular biology, immunology, cancer treatment, microbiology, evolutionary genetics, coral reef physiology, and high energy physics. The forum provided an excellent opportunity for networking and exchanging ideas across disciplines. Feedback from presenters and delegates was very positive.

Proceedings are available at www.science.org.au/events/frontiers2005.

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Inaugural Douglas Scholarship winner

Kerry-Ann O'Grady, a PhD candidate in the School of Population Health and the Department of Paediatrics at the University of Melbourne, is the inaugural winner of the Academy's Douglas and Lola Douglas Scholarship in Medical Science

The scholarship has been made possible through a bequest from the estate of Miss Lola Douglas. Through her bequest, the Academy will be fulfilling one of Miss Douglas' great wishes - to support young researchers. The scholarship will be awarded annually to a high-ranked PhD candidate who has been awarded an NHMRC Training Scholarship in indigenous or primary health care, with preference given to the area of indigenous health research. The scholarship will be awarded on condition that the scholar continues to hold the NHMRC Training Scholarship



Kerry-Ann O'Grady

and is enrolled in a PhD program.

Kerry-Anne's research will document the occurrence of hospitalised, radiologically diagnosed pneumonia in young Aboriginal children in the Northern Territory. It will also assess the impact of pneumococcal vaccination strategies on the incidence of disease.

Forthcoming events

- 'Dynamic Planet 2005: Monitoring and understanding a dynamic planet with geodetic and oceanographic tools'. Cairns, 22-26 August. www.dynamicplanet2005.com.
- 'Epigenetic regulation in development and disease'. A conference in the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series. CSIRO Discovery Centre, Plant Industry, Canberra, 29 November-2 December. www.oliphant.org.au.
- 'Bio-engineering and nanotechnology'. A conference in the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series. University of Queensland, 5-7 December. www.oliphant.org.au.

Eureka moments! travelling exhibition

- **31 July to 4 September**
Queensland Museum Southbank,
Grey and Melbourne Streets,
Brisbane
- **7 September to 9 October**
Gin Gin Courthouse Gallery,
80a Mulgrave Street, Gin Gin
- **12 October to 10 November**

Museum of Tropical Queensland,
70-102 Flinders Street, Townsville

www.science.org.au/eureka

New topics on Nova

- Bird flu — the pandemic clock is ticking.
- Population and environment — what's the connection?

www.science.org.au/nova

Award deadlines 2005

- Junior and senior awards for outstanding research. Closing date 30 September.
- Travelling Fellowships. Closing date 30 September.
- Research Conferences. Closing date 30 September.
- Support for Research on Endangered Australian Vertebrate Species. Closing date 30 September.

See www.science.org.au/awards for the conditions of each award and nomination forms.

Gifts to the Academy

If you would like to make a gift or a bequest to the Academy please contact the Executive Secretary, Professor Sue Serjeantson, on (02) 6247 5777 or es@science.org.au.

William Sutherland and the ‘Sutherland-Einstein’ diffusion relation

by Emeritus Professor Rod Home*, FAHA
University of Melbourne

Albert Einstein submitted his doctoral thesis at the University of Zürich on 20 July 1905. With a brief appendix, the thesis, which included the first published statement of the ‘Einstein relation’ linking diffusion with viscosity, appeared in print in *Annalen der Physik* in January 1906 and later became the most frequently cited of all Einstein’s early papers.

Remarkably, the diffusion-viscosity relationship was discovered in Australia at practically the same time by the Melbourne physicist William Sutherland, on the basis of exactly the same chain of reasoning as Einstein had gone through. His paper was published in the *Philosophical Magazine* in June 1905. Why is Sutherland virtually unknown today and why wasn’t his name attached to the relationship along with Einstein’s?

Sutherland studied at the University of Melbourne and at University College London. Following his return to Melbourne in 1882, Sutherland never held a regular position and had no access to laboratory facilities. Perforce, he became a theoretical physicist, relying on the journals of the day for the experimental data he needed to support his theoretical computations. He speculated, but always in a way that linked to, drew upon and suggested new experimental inquiries.

At the time of Sutherland’s return to Australia there was nobody in Melbourne, and virtually nobody anywhere in Australia, with whom he could have serious discussions about the work he was doing. He worked almost entirely on his own, without even the benefit of discussions by correspondence with colleagues in Europe.

His primary area of research was molecular theory and he took it for granted that the properties of fluids were to be understood in terms of the mechanical behaviour of the molecules of which they were composed. He assumed that the molecules would exert attractive forces on each other in addition to gravity and concluded that this force was proportional to the product of the masses of the attracting molecules and inversely

proportional to the fourth power of the distance between them. He published a long series of papers in the leading international journals developing this line of thinking. In one of these he resolved a notorious discrepancy between experiment and theory in regard to the dependence of the viscosity of a gas on its temperature, arguing that because of the intermolecular attraction, an extra term C/T should be included in the formula, where C is a constant for any particular gas that is now known as Sutherland’s Constant.

The work that led Sutherland to the ‘Sutherland-Einstein’ diffusion relationship was prompted by his on-going concern with molecular mechanics, and his recognition that existing methods of determining the masses of molecules didn’t work with the very large molecules of substances such as albumin that physiologists were working with. He sought a relationship between the measured velocity of diffusion of albumin through water and the size of its molecule. Having arrived at the famous relationship early in his paper, he proceeded to devote the remainder of the paper to using it to compute the radius of an albumin molecule and, from this, the molecular mass.

Why is the diffusion-viscosity relation generally known as the Einstein relation, not the Sutherland-Einstein relation? In part, this happened because in the early 20th century, theoretical physics was a largely German affair. In Britain, where the *Philosophical Magazine* was one of the leading journals in the field, Sutherland didn’t have a readership likely to be alert to the significance of his formula. And his presentation surely did not help, with the relation itself appearing as an incidental result, buried in a paper entitled ‘A dynamical theory of diffusion for non-electrolytes and the molecular mass of albumin’, rather than as something of value in its own right. He should have published and promoted it separately—but that was not his style.

This is an abbreviated version of an article which appeared in *The Australian Physicist*, vol. 42, no. 2, May/June 2005.

* Professor Home was awarded the Academy Medal in 2004.



William Sutherland

Symposium on stem cells

This year’s annual symposium, held on 6 May as part of the Academy’s *Science at the Shine Dome* celebrations, was on the topic *Recent advances in stem cell science and therapies*. It was a most timely topic because this year two Acts of Parliament will be reviewed, the *Research Involving Human Embryos Act 2002* and the *Prohibition of Human Cloning Act 2002*. Our symposium ensured that the very best international science was available to policy makers. The symposium proceedings are available at www.science.org.au/sats2005/symposium.htm.

The Academy’s recent submission to the Legislation Review of Australia’s *Prohibition of Human Cloning Act 2002* and *Research Involving Human Embryos Act 2002* is available at www.science.org.au/reports/25july05.pdf.

New members of Council



Philip Kuchel

Professor Philip Kuchel is the new Secretary, Science Policy. He is Professor of Biochemistry at the University of Sydney. He has published over 300 scientific papers and, amongst several books, he has co-edited *Schaum's Outline of Theory and Problems of Biochemistry*. His research area is physical biochemistry, which involves biochemical analyses as well as mathematical and physical descriptions of macromolecular and cellular systems. His main technological focus is nuclear magnetic resonance spectroscopy (NMR). He has been President of the Australian Society for Biochemistry and Molecular Biology, the Australian Society for Biophysics, and inter alia Chair of the Academy's Europe Exchange Committee, National Committee for Biomedical Sciences, and Nuffield Fellowships Committee.



Phil McFadden

Dr Phil McFadden is the new Treasurer. He is Chief Scientist, and currently Chief of the Geospatial and Earth Monitoring Division, at Geoscience Australia. His research interests have spanned paleomagnetism, geomagnetism, seismology, airborne geophysics, mathematical statistics, numerical analysis and computing systems. Recently he has been deeply involved in developing the Australian Tsunami Warning System.

Professor Sally Smith is a member in the biological sciences. She is Director of the Centre for Plant Root Symbioses, School of Earth and Environmental Sciences, University of Adelaide. Her chief research interest is the analysis of the processes involved in the development and function of mycorrhizal infection in plant root systems.



Sally Smith



Bob Williamson

Professor Bob Williamson is a member in the biological sciences. Before he retired in 2004 he was Director of the Murdoch Institute and Professor of Medical Genetics at the University of Melbourne. He is now Honorary Senior Principal Fellow and Professor of the University of Melbourne. He worked on the identification of the genes for cystic fibrosis, Friedreich ataxia and Alzheimer disease. More recently, he has taken a major interest in national science policy and ethics. He chairs the OECD Committee on Pharmacogenetics, and has worked extensively for the World Health Organization.

ANZAAS medals

The Australian and New Zealand Association for the Advancement of Science (ANZAAS) is seeking nominations for its ANZAAS and Mueller medals for presentation in 2006. The ANZAAS medal is awarded for outstanding services to the advancement of science, and/or the administration and organisation of scientific activities, and/or the teaching of science in Australia or New Zealand, and/or for contributions to science which lie beyond normal professional activities. The Mueller medal is awarded to a scientist who is author of important contributions in any of the fields of anthropology, botany, geology, or zoology, having special reference to Australia.

Nominations should reach the Honorary Secretary, ANZAAS, University of Adelaide, Adelaide, South Australia, 5005 (or email secretary@anzaas.org.au) not later than 16 September 2005. Further information is available at www.anzaas.org.au/medals.html.



Professor Dick Stanton, FAA (second from left) presenting the 2005 Haddon Forrester King Medal to Professor Ross Large, FTSE, Professor of Geology and Director of the ARC Centre for Ore Deposit Research (CODES), University of Tasmania. The presentation was made at a dinner held at the Woodward Centre in Melbourne on 22 July. Professor Large is shown here accompanied by his wife, Marlene, and son Adrian.

Disappearing dragons

by Dr Jane Melville

Curator of Herpetology
Department of Sciences
Museum Victoria

In 2004 I received the Academy's Award for Research on the Conservation of Endangered Australian Vertebrate Species, to investigate the conservation genetics of endangered Earless Dragons in Victoria. My research team and I have spent the last year investigating the taxonomic status of the Grassland Earless Dragon, a species not seen in Victoria for about 15 years and one that may be close to extinction. We set out to determine if the Victorian population of this species, *Tympanocryptis pinguicolla*, was genetically distinct from other populations. This information is vital for conservation management, especially to determine if translocation of individuals from other populations could succeed.

The task of investigating the genetics of a population that has not been seen alive for 15 years, and for which just a few very old preserved specimens exist, appears daunting. But we were up for the challenge! Museum Victoria set up a specialised 'Ancient DNA Laboratory', which is designed to deal with old and degraded DNA, so we had the ideal facilities to attempt such research. Using this lab we have been developing specialised techniques to extract DNA from specimens in the museum collections dating back to the late 1800s. These techniques include much longer protocols for removing DNA from small amounts of tissue and then sequencing many very small fragments of DNA to make a composite 'picture' of a larger piece of DNA. These methods enable us to compare the DNA of Victorian Grassland Earless Dragons to populations from other states.

This small dragon lizard is in urgent need of conservation attention. The taxonomic status of Grassland Earless Dragon populations remains uncertain, as there is some doubt as to whether described populations are even related to each other. But regardless of their affinity to other populations, conservation research on the Victorian Grassland Earless Dragons is of pressing importance, as this population represents the most southerly range of a disjunct distribution and is totally isolated from other populations. The species occurs in three geographically isolated regions: native grasslands west of Melbourne; grasslands in Canberra

and adjoining areas of NSW; and on the Darling Downs, Queensland. As suggested by its name, it is restricted to areas of native grasslands, which are unfortunately affected by urbanisation or agriculture. This small species of dragon lizard is currently listed as critically endangered throughout its range with legislation protecting it in the Australian Capital Territory, New South Wales, Queensland and Victoria. Due to continued destruction of native grasslands west of Melbourne from

genetic difference between Victorian Grassland Earless Dragons and those from the Darling Downs, Queensland. The genetic difference between these two populations (12 per cent) is so great that they are undoubtedly different species.

Although these results are exciting, they unfortunately indicate that translocation of individuals from other populations to the native grasslands around Melbourne is not appropriate. Our results provide evidence that the



Dr Jane Melville, working with museum specimens.

development and farming, this species is now in immediate and serious risk of becoming locally extinct in Victoria.

It has been suggested that translocation into native grasslands around Melbourne from other populations is a possible conservation management strategy. But our findings suggest that introduction from other populations would not be a viable strategy. My research team, including 'ancient DNA' specialist Dr Jeremy Austin, has successfully sequenced DNA from a number of specimens of Victorian Grassland Earless Dragons from the late 1800s and early 1900s. If the DNA from Victorian dragons is compared with that of populations from NSW and Canberra, we find that there are significant genetic differences between the two populations. In fact, the difference in the DNA between these two regions is great enough to indicate that these populations have a very long history of geographic isolation. Even more dramatic is the

Melbourne population of Grassland Earless Dragons has been genetically isolated from populations in NSW and Canberra for many thousands of years. The Victorian Grassland Earless Dragons are truly a southern isolate of this species. Hopefully our genetic research will help emphasise the importance of conservation work aimed at locating remaining populations and protecting those sites.

Our study has opened up a wealth of possibilities in using historical specimens for conservation research. In recent times, genetics has come to play a central role in conservation research and most management strategies promote the maintenance of genetic diversity. But trying to determine the naturally occurring genetic diversity of a species when it has already declined in numbers is difficult – so by using historical specimens at museums there is a better chance in estimating what the genetic diversity might have been in the past.

New Fellows



Samuel Berkovic

Sixteen of Australia's leading scientists were honoured on 25 March by election to the Academy. Election recognises a career that has significantly advanced, and continues to advance, the world's scientific knowledge.

Professor Samuel Berkovic

Director, Epilepsy Research Centre and Professor (Personal Chair), Department of Medicine, Austin Health, University of Melbourne

Samuel Berkovic has made discoveries about familial forms of epilepsy that have led to a complete overhaul of their clinical management and provided new insights into their underlying biology. His research has established that mutations in single genes cause epileptic seizures. Sam Berkovic and his collaborators have discovered eight of the twelve genes presently known for which mutations are associated with idiopathic epilepsies. These discoveries have revolutionised basic scientific research into epilepsy.



Michael Eastwood

Professor Michael Eastwood

ARC Senior Research Fellow, Department of Mathematics, University of Adelaide

After receiving a PhD from Princeton University in several complex variables, Mike Eastwood spent eight years in Oxford working with Roger Penrose and others on differential geometry and twistor theory. He moved to Adelaide in 1985. A key idea in his work has been that of symmetry and symmetry-breaking coming from physical problems and the appropriate form of calculus. He has made major contributions to conformal differential geometry, especially the construction of invariant differential operators.



Jeffrey Ellis

Dr Jeffrey Ellis

Research Scientist and Program Leader, Genetic Engineering for Plant



Jorgen Frederiksen

Improvement, CSIRO Plant Industry, Canberra

Jeff Ellis is renowned for his work in plant molecular biology and, in particular, for research into disease resistance genes. In 1994 Ellis and his colleagues cloned the first plant rust resistance gene from flax and he has made major advances in the understanding of the rust plant interactions and the relationship between the avirulence genes from the flax rust and the resistance genes from the flax plant. Earlier, Ellis played an important role in developing the agrobacterial transformation of plants.

Dr Jorgen Frederiksen

Chief Research Scientist, CSIRO Atmospheric Research, Aspendale, Victoria

Jorgen Frederiksen has aided the fundamental understanding of a number of atmospheric processes, supporting mathematical simplifications needed for numerical forecasts of weather and climate. His work elucidates the formation of localised low-pressure cyclones, the path of storms and the way good or bad weather sometimes persists abnormally through 'blocking' of weather systems.

Professor Franz Grieser

Professor of Chemistry, School of Chemistry, University of Melbourne

Franz Grieser is an outstanding physical chemist with over 200 highly cited publications in such fields as radiation chemistry, spectroscopy and surface chemistry. Most recently he has become an international leader in the exciting field of 'sonochemistry', where ultra-sound initiates exotic and ultra-high temperature and pressure chemical reactions in liquids as bubbles implode as the sound wave passes through the liquid.



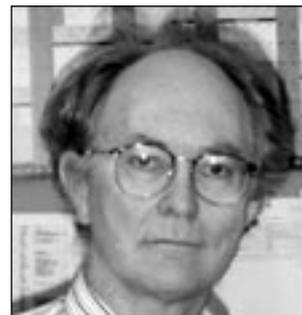
Franz Grieser



Ruth Hall



Mark Harrison



Richard Hartley

Professor Ruth Hall

NHMRC Senior Principal Research Fellow, School of Molecular and Microbial Biosciences, University of Sydney

Ruth Hall has made an exceptional contribution to microbiology and genetics. She has identified and analysed a novel genetic system, which facilitates the organisation of genes specifying antibiotic resistance into clusters, which can be freely transmitted between different bacteria. The existence of these genetic systems known as integrons offers an explanation for the emergence and spread of microorganisms that are resistant to a number of different antibiotics.

Professor Mark Harrison

Director, Research School of Earth Sciences, Australian National University, Canberra

Mark Harrison has advanced our understanding of processes which form major 'alpine' mountain ranges. He developed new microscale techniques for extracting information on time, temperature and pressure (depth) from minerals, combined with field and laboratory studies of the enclosing rocks. His work on timing and tectonic processes in the Indian/Asian (Himalayan) collision zone is very influential. He has also made important inferences on the earliest stages of Earth history, suggesting that organic materials may exceed 3.3 billion years in age.

Professor Richard Hartley

Department of Information Engineering, Research School of Information Science and Engineering, Australian National University, Canberra; Program Leader, Autonomous Systems and Sensing Technology Program, National ICT Australia, Canberra

Richard Hartley's best known work relates to analysis of sequences of photos, or film video, and extraction of computer models from this data. Applying techniques of projective geometry, he developed efficient methods for computing the 3-dimensional structure of the imaged scene, and the camera motion within it. This work led to a new understanding of the basic geometric theory underlying video and image formation. It finds application in the creation of special effects in films.

Dr Robin Holliday

Former Chief Research Scientist, CSIRO Division of Biomolecular Engineering, Sydney

Robin Holliday has made fundamental contributions to molecular genetics, epigenetics and cell biology. He postulated the intermediate in genetic recombination, the 'Holliday Structure', which is now accepted as integral to the process of recombination. His work on cellular ageing implicated protein errors as being important in the ageing process. His pioneering work in epigenetics and the role of DNA methylation has led to advances in our understanding of the importance of the epigenetic control of development.

Professor Stephen Hyde

ARC Federation Fellow and Professor of Physics, Department of Applied Mathematics, Research School of Physical Sciences and Engineering, Australian National University, Canberra

Stephen Hyde's interests span traditional disciplines, from the spatial organisation of atoms and molecules in solid and liquid crystals, to exploration of structural differences in biological and non-living matter and the theory of three-dimensional networks. These

interests share a common basis in modern geometry and topology, with particular focus on non-Euclidean geometry and its manifestations in the physical sciences. His credo is a simple one: first understand the nature of space and form within space, then worry about the detailed physics.

Professor Chennupati Jagadish

ARC Federation Fellow, Professor and Head, Semiconductor Optoelectronics and Nanotechnology Group, Department of Electronic Materials Engineering, Research School of Physical Sciences and Engineering, Australian National University, Canberra

Chennupati Jagadish is an acknowledged world leader in the research field of semiconductor optoelectronics. He has pioneered novel processes in compound semiconductors that have led to innovative quantum well, quantum wire and quantum dot lasers. These achievements have been predicated on a deep understanding of the underlying solid state physics including defects and diffusion processing. His work on quantum dots is particularly noteworthy and has led to several world records for device performance.

Professor Trevor Lamb

ARC Federation Fellow, Division of Neuroscience, John Curtin School of Medical Research, Australian National University, Canberra

Trevor Lamb has made major contributions to our understanding of the molecular mechanisms by which light absorption triggers a neural signal in retinal photoreceptors. He invented the method for recording electrically from isolated photoreceptor cells and discovered rod responses to single photons; developed a mathematical

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Robin Holliday



Stephen Hyde



Chennupati Jagadish



Trevor Lamb

New Fellows *(continued from page 7)*



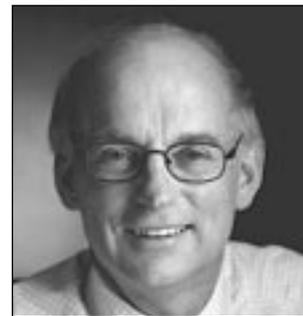
Geoffrey McFadden



Amnon Neeman



Hugh Possingham



John Ralston

description of the molecular steps involved in activation; accounted for light adaptation; and provided a molecular description of dark adaptation and retinoid recycling.

Professor Geoffrey McFadden

ARC Professorial Fellow, School of Botany, University of Melbourne

Geoff McFadden is an expert on the biology and evolution of Protists. His research into the organelles of these cells has shown that the parasite responsible for malaria contains a relict chloroplast and thus it must have originally evolved from a parasitic alga. This result could never have been predicted from previous research and it offers real hope of novel approaches for combating this deadly parasite by targeting its relic chloroplast.

Professor Amnon Neeman

Centre for Mathematics and its Applications, Australian National University, Canberra

Amnon Neeman has produced a body of profound work of central importance in the core mathematical disciplines of

algebraic geometry, topology and K-theory. He has pioneered developments in triangulated categories and their applications, his results completely changing the subject. Amnon Neeman extended the Brown representability theorem: foundation work that rendered more powerful techniques. He has made notable contributions to algebraic geometry, especially geometric invariant theory and has made important contributions to the interplay of analytic and algebraic invariants of manifolds.

Professor Hugh Possingham

Director, The Ecology Centre, and Professor of Ecology and Mathematics, University of Queensland

Hugh Possingham spearheads an emerging interdisciplinary field, 'applied theoretical ecology', that focuses on solutions to problems such as managing fire in natural areas; protecting threatened species; designing systems of nature reserves; finding optimal ways to conduct ecological monitoring; and judging the best way to allocate funds for

conservation activities. Mathematical models of animal and plant populations underpin the capacity to harvest species, to control weeds and pests, and to conserve threatened species.

Professor John Ralston

Director, Ian Wark Research Institute and Professor of Physical Chemistry and Minerals Processing, University of South Australia

John Ralston is an internationally recognised expert in colloid and surface chemistry and their application in metallurgical engineering and technology. His research is internationally recognised in the physical chemistry of mineral flotation processes, the surface chemistry of metal sulphides, and the static and dynamic wetting behaviour of simple and structured solid surfaces. In 1994 he established the Ian Wark Research Institute, which is now recognised worldwide for its fundamental research in interfaces, initially with a strong mineral focus.

Corresponding Members

Two of the Academy's Corresponding Members were able to attend *Science at the Shine Dome* events in May and to sign the Charter Book. Professor John Boyer, E I du Pont Professor of Marine Plant Biochemistry and Biophysics at the University of Delaware, presented his work on 'Intravenous feeding: helping unravel how plants reproduce when water is limited'. Professor Gunnar Öquist spoke at the formal dinner held in the Great Hall at Parliament House about the role of science academies in our times. Professor Öquist is a pre-eminent plant physiologist and is also Secretary-General of the Royal Swedish Academy of Sciences (*see photo on page 12*).

A Corresponding Member is a person who is eminent in respect of scientific discoveries and attainments but is not normally resident in Australia. No more than two Corresponding Members can be elected in any one year. The Academy's Corresponding Members for 2005 are **Professor Marc Feldmann**, Imperial College London, and **Professor Yongxiang Lu**, President of the Chinese Academy of Sciences.

Professor Marc Feldmann is Head of the Kennedy Institute of Rheumatology Division at Imperial College. He has made important contributions to our understanding of the pathogenesis and treatment of chronic autoimmune and

inflammatory disorders. His research led to the development of an effective therapy for patients with resistant rheumatoid arthritis and Crohn's disease.

Professor Yongxiang Lu has served as the President of the Chinese Academy of Sciences since 1997 and actively promotes the development of scientific research and education. He is currently Vice Chairman of the Standing Committee of the National People's Congress, People's Republic of China. He has published more than 250 papers on engineering and engineering education and is the author of two books; he also owns 20 patents.

International news

Europe

The Academy's Foreign Secretary, Professor Bruce McKellar, travelled to Brussels as part of the Australian delegation attending the 8th EU-Australia Joint Science and Technology Cooperation Committee Meeting between the European Commission and the Department of Education, Science and Training (DEST) on 5 April. Discussions at the meetings revolved around Australian participation in the 6th Framework Program, the Commission's plans for the 7th Framework Program, and the Marie Curie Fellowships.

The Australian National University (ANU) has received funding from the European Commission and DEST to continue the work started under the Forum for European Australian Science and Technology Cooperation (FEAST). The new project, FEAST II, will be led by the Europe Centre at the ANU.

Alain Moulet, former Science and Technology Attaché at the French Embassy, was recently awarded the medal of 'chevalier de l'ordre national du mérite' for services to the promotion of research collaborations between France and Australia. Alain was one of the founders of the FEAST initiative.

The Academy was invited to select 10 young Australian researchers to attend the Lindau Foundation Nobel Laureate meeting at Lake Constance in Germany. The group were in Lindau from 26 June to 1 July, to meet with some 50 Nobel Laureates and 600 students from around the globe. The group participated in plenary sessions, round-table debates and small group discussions within and beyond their respective disciplines. The Academy's Secretary, Science Policy, Professor Phil Kuchel participated in the meeting as an observer.

North America

Janet Walden, Vice-President for Research Partnerships Programs with the Natural Sciences and Engineering Research Council of Canada (NSERC), met with Professor Bruce McKellar at the Academy on 11 April.

NSERC supports basic university research through grants, and project research through partnerships among universities, governments and the



Visiting US graduate students.

private sector. NSERC was interested in expanding its understanding of innovation in Australia.

The National Science Foundation (NSF) and the Academy have a joint program which enables 20 US graduate students in science and engineering to visit Australia every year for a period of eight weeks during the American summer, to conduct research in laboratories and to initiate personal relationships with their Australian counterparts.

The host research institutions are providing the students with office accommodation, access to laboratory, library and computing facilities, technical assistance, and the time and expertise of the host researcher.

As part of the summer program, the Academy organised an orientation session for the students in Canberra from 15-17 June, which included a talk by Professor Hugh Tyndale-Biscoe on his marsupial research and visits to the National Botanic Gardens, Mt Stromlo, and attendance at Question Time at Parliament House. They also had the opportunity to meet with the Chargé d'Affairs of the US Embassy, Mr William Stanton.

Professor Bruce McKellar visited the NSF in Arlington, Virginia, on 19 July to discuss plans for the 2006 program.

Asia/Pacific

The Academy and the Australian Academy of Technological Sciences and Engineering (ATSE) made joint submissions to the Senate Foreign Affairs, Defence and Trade Committee and to the Foreign Affairs Subcommittee Joint Standing Committee on Foreign Affairs and Trade in

relation to Australia's relationship with China and Korea. Professor Andrew Smith, appeared on behalf of the two Academies before a hearing in relation to Australia's relationship with China on 20 June.

Professor Bruce McKellar was in Taiwan from 9 to 20 May, at the invitation of the National Science Council of Taiwan (NSC), to gain an insight into scientific research in Taiwan, with the aim of improving Australia-Taiwan scientific cooperation. The Taipei Economic and Cultural Office in Canberra and NSC put together a program of visits for Professor McKellar, which included the Industrial Technological Research Institute, the Academia Sinica and the Science Parks at Hsinchu and Tainan. Professor McKellar took the opportunity to give two lectures while in Taiwan: 'Physics in Australia - an overview' (National Central University), and 'Ethics and Scientific Research' (NSC).

Dr Steve Thompson, Executive Director, Royal Society of New Zealand (RSNZ), met with Professor Hugh Tyndale-Biscoe on 6 June. Dr Thompson was in Australia to meet with counterparts at the Australian Research Council, the Federation of Australian Scientific and Technological Societies, CSIRO and the Academy, to be updated on Australia's international collaborations. Professor Tyndale-Biscoe, who is an Honorary Fellow of RSNZ, discussed ways in which the Academy and RSNZ could work together.

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International news

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Professor Terry Hughes delivered a lecture, 'History, ecology and the state of the world's oceans', at the Science University of Malaysia on 16 June. Co-hosted by the Malaysian Academy of Sciences, the lecture was attended by more than 100 students and researchers.

ICSU is establishing four regional offices for Africa, the Arab States, Asia and the Pacific, and Latin America, including the Caribbean. The first ICSU Regional Meeting for Asia and the Pacific was held in Kuala Lumpur from 25 to 27 April. Dr John Church of CSIRO Marine Research, attended the meeting in his capacity as Vice-President of the Scientific Committee of the World Climate Research Programme, and also represented the Academy.

The regional office for Asia and Pacific is expected to be located at the Malaysian Academy of Science in Kuala Lumpur. The regional offices will be important in linking scientists from the regions to ICSU activities and to its Members and Interdisciplinary Bodies.

Primary Connections teacher workshops



Academy Fellows Professor Jenny Graves (left) and Professor Tony Klein with workshop participants in Melbourne, Olga Kumpis (Mt Faulkner Primary School, Tasmania) and Penny Solomon (Commercial Road Primary School, Victoria).

The trial of *Primary Connections* continues in 56 schools nationally. *Primary Connections* is an innovative program linking science with literacy in Australian primary schools. The program is a partnership between the Academy and the Department of Education, Science and Training.

In June the second round of teacher workshops took place in five capital

cities. The workshops are part of an ongoing professional learning program developed to support teachers who are trialling *Primary Connections*. A highlight of these workshops was the lunchtime visit by Academy Fellows, which added a special dimension to the day.

More information is available at www.science.org.au/primaryconnections.

News from our National Committees

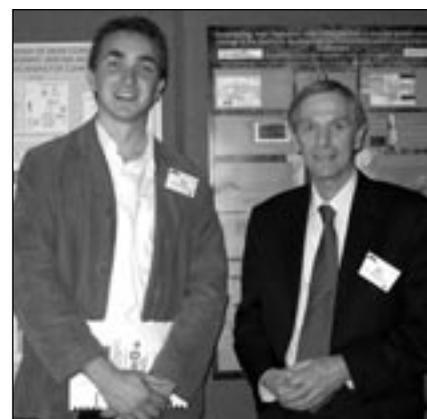
The **Chemistry Committee** initiated the organisation of a symposium on green chemistry, which was held at the Shine Dome in Canberra on 20 April. The symposium was funded by the Australian Research Council Special Research Centre for Green Chemistry at Monash University, with support from the Academy, the Australian Academy of Technological Sciences and Engineering, the Royal Australian Chemical Institute and CSIRO. Over a hundred enthusiastic participants, including senior figures from the chemical industry, government and academia, together with a group of postgraduate students and postdoctoral research workers, heard a series of stimulating presentations from leading green chemistry advocates. After the formal presentations, a lively discussion session was held. A general consensus was that green chemistry principles would be adopted for economic reasons as well as legislative

pressure and that the Australian chemical industry was highly in favour of such an approach.

A workshop entitled 'Reconstructing past climates for future prediction: Integrating high-resolution palaeo-data for meaningful prediction in the Australasian region' was held at the Shine Dome on 27 and 28 June. It was held under the auspices of the **Earth System Science Committee** and the **Quaternary Research Committee**, the GeoQuEST Research Centre, IGBP Past Global Changes, PAGES/CLIVAR Intersection and the International Union for Quaternary Research (INQUA), and jointly funded by the Australian Greenhouse Office and the Australian Research Council Research Networks 'Discovering the Past and Present to Shape the Future' and 'Earth System Science'. The two-day workshop provided a forum for prominent Australian and international climatologists and modellers to focus

on new ideas, observations, analyses and theories of climate change.

More information is available at www.uow.edu.au/conferences/canberra.



Palaeo-data workshop organisers Dr Chris Turney, University of Wollongong, (left) and Dr Mike Manton (formerly Bureau of Meteorology Research Centre).

OBITUARY

Ian McCarthy



Ian Ellery McCarthy was born in Adelaide on 19 June 1930 and died there on 23 April 2005. He was educated at St Peter's College, where he excelled not only scholastically but also at rowing and clarinet, and at the University of Adelaide (BSc 1952, PhD in mathematical physics 1956).

After postdoctoral appointments of about two years each at Cambridge University, the University of Minnesota and the University of California, Los Angeles, he returned to the University of Adelaide in 1960 as a lecturer and then senior lecturer in mathematical physics. In 1963 he accepted an appointment as Associate Professor of Physics at the University of California, Davis, moving to the University of Oregon as Professor of Physics in 1965. In 1968 he moved back to Adelaide to take up the position of Professor of Physics at Flinders University, retiring in 1996.

His work encompassed several distinct areas of theoretical physics but was united by a common methodology, the calculation of quantal scattering and reaction processes. His first work was on the optical model of the nucleus, where he studied nuclear reactions and the information they can give about nuclear wave functions. He was also active in treating nucleon-nucleus interactions as quasi three body systems, making useful contributions to the treatment of deuteron stripping reactions.

McCarthy's second major contribution was to (e, 2e) spectroscopy,

in partnership with Erich Weigold. This led to determinations of the momentum distribution of the struck electrons. His group at Flinders University became a world leader in this area.

He was also involved in a number of other theoretical advances, including the semi classical exchange approximation, widely regarded as one of the best approximate static exchange potentials for electron scattering calculations. Later work was on including continuum effects in optical model calculations.

McCarthy was elected to the Australian Academy of Science in

1982. He was also a Fellow of the American Physical Society and the Australian Institute of Physics. He presented invited papers at a number of international conferences and was a member of the international editorial committee for the *Journal of Electron Spectroscopy and Related Phenomena*. In addition, he wrote a graduate textbook, *Introduction to Nuclear Theory* (1968), and a senior secondary textbook, *Physics, a Laboratory-Oriented Approach* (1973), the latter with a number of co-authors.

He is survived by his wife Janet, his children Catherine, Helen, James, Jane and Patrick, and his nine grandchildren.

Honours to Fellows

Professor Alan Bond, Monash University, has been awarded an Australian Research Council Federation Fellowship for integration of electrochemistry and green chemistry.

Two Fellows have been elected as Fellows of the Royal Society.

Professor Ron Ekers, CSIRO Australia Telescope National Facility, for his work in astronomy; and **Professor Brian Kennett**, Australian National University, for his work in seismology.

Professor Chris Goodnow, Australian National University, has been awarded the Commonwealth Health Minister's Award for Excellence in Health and Medical Research for his work in molecular genetics.

Professor Kurt Lambeck, Australian National University, has been elected a Foreign Associate of the French Academy of Sciences.

Sir Gus Nossal's extraordinary contribution to international medical research has been honoured by the University of Melbourne's Faculty of Medicine, Dentistry and Health Sciences with the creation of the Nossal Institute for Global Health. The Institute is a new research node bringing together University expertise in child health, mental health, women's health, and vaccines. It will incorporate the many international service programs undertaken by the Australian International Health Institute.

Corresponding Member, **Professor Joseph Connell**, University of California, Santa Barbara, USA, has been elected as a Fellow of the American Academy of Arts and Sciences.

Queen's Birthday honours

Order of Australia – Officer in the General Division (AO)

Professor Thomas Healy, University of Melbourne, 'for service to science as a researcher and academic in the area of physical chemistry, and to the community through support for the activities of the Ian Potter Foundation and Philanthropy Australia'.

Professor Graeme Jameson, University of Newcastle, 'for service to engineering, science, industry and the environment as an inventor, and through contributions in the fields of fluid and particle mechanics, mineral processing, water and wastewater treatment and particle technology'.

Order of Australia – Member in the General Division (AM)

Professor Samuel Berkovic, University of Melbourne, awarded Member of the Order of Australia (AM) 'for service to medicine as a neurologist, particularly in the field of epilepsy research and treatment'.

Professor Hans Freeman, University of Sydney, 'for service to science and scientific research in the field of bio-inorganic chemistry, particularly through the establishment and development of the discipline of crystallography in Australia'.

Professor Richard Shine, University of Sydney, 'for service to science in the field of herpetology as a researcher and educator, and through contributions to a range of Australian and international herpetological organisations and publications'.

Nova: Science in the news

www.science.org.au/nova

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

Bird flu – the pandemic clock is ticking

With the number of deaths in Asia from bird flu rising, authorities say it is only a matter of time before the next flu pandemic strikes. We tend to think of colds and flu as the same thing. Although the symptoms are similar, a head cold and the flu are caused by different viruses. For some the flu can be a very dangerous disease. New flu types come along every year as minor variants of existing viruses. Occasionally a radically different virus emerges which has the potential to cause a pandemic.

Since December 2003, a type of flu known as H5N1 has caused the flu in poultry and wild birds in a number of Asian countries. People can get H5N1 bird flu by close contact with infected birds or water. Authorities are worried about H5N1 because it has many of the characteristics of a virus that can cause a pandemic. So far, H5N1 has not shown signs of being very easily transferred from one person to the next via casual contact.

The concern is that you might get a virus like H5N1, that is already lethal, becoming extremely contagious, which

would make it easier for it to spread from person to person.

Most health officials believe that a pandemic is due to occur some time soon, and that it is a case of when, not if. In which case, it would be wise to be ready for it.

The buzz about insect robots

Insects are an immensely diverse form of life, using a wide variety of strategies for things like movement, navigation and vision. And recent advances in miniaturisation make the construction of insect-sized robots possible.

Scientists have already developed six-legged robots, but have been unable to achieve much in the way of speed. Cockroaches are showing us how it can be done. Scientists are also studying bee vision to overcome problems with navigation by robots, and studying insect aerodynamic techniques to find out how insects perform their astounding aerobatics.

This topic was developed with support from the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series (oliphant.org.au). The principal sponsor of *Nova* is the Commonwealth Bank Foundation (www.commbank.com.au/foundation).

Review of learned academies

The Department of Education, Science and Training provides a Grant-in-Aid to each of the four learned academies and to the National Academy Forum. The Grant-in Aid guidelines for the Learned Academy Scheme call for a review of the scheme every five years. The 2005 review will be held on 17-18 September. The Minister for Education, Science and Training, the Hon. Brendan Nelson MP, has agreed that the review be conducted by a three-person committee comprising Professor Bruce Alberts (outgoing President of the US National Academy of Sciences); John Ralph, AC, FAA (Deputy Chair of Telstra Corporation) and Professor John Hay, AC (Vice-Chancellor and President, University of Queensland). The Minister has provided the terms of reference for the review.

Oliphant Conference

The University of Western Australia hosted an international conference entitled *Thresholds and pattern dynamics* from 4-7 July. The meeting focused on novel approaches that will account for the unobservable nature of those hydrological processes for predicting the effects of climate and land-use change (www.thresholds.segs.uwa.edu.au).

The Sir Mark Oliphant International Frontiers of Science and Technology Conference Series is co-sponsored by the Academy, ATSE, and Engineers Australia.

Biographers

Memoirs of deceased Fellows are published in *Historical Records of Australian Science* and are also available on the Academy's website at www.science.org.au/academy/memoirs.

The biographers for **Professor John Carver** are Professor Bob Crompton, Dr Ken McCracken, Professor George Dracoulis, Professor Jim Williams and Dr Brenton Lewis.

Newsletter online

To receive email notification when new issues of the *Newsletter* become available online, register at www.science.org.au/infolist.htm.



From left: Academy President Dr Jim Peacock with Corresponding Members Professor John Boyer and Professor Gunnar Öquist (see page 8).