



High flyers tackle emerging diseases and biosecurity

The 2004 High Flyers Think Tank was held on 19 October in Brisbane's Custom House. Entitled *Emerging diseases – Ready and waiting?*, the Think Tank targeted Australia's preparedness to deal with the increasing threat of new diseases in today's world of increased global trade, tourism and bioterrorism. It was hosted by the Academy as part of its 50th anniversary celebrations and brought together fifty of Australia's brightest young minds — early- to mid-career researchers from a broad range of science, technology, communication and social science disciplines.

Think Tank participants discussed current trends and brainstormed novel applications of their research to improve biosecurity preparedness, surveillance, diagnostic procedures and enhanced ability to control and eradicate exotic diseases affecting humans, animals, plants and aquatic organisms. Given that Australia is a land girt by sea, it is particularly important to recognise that diseases are not restricted to the territorial realm. For example, on two occasions in the late 1990s, mass fish kills across the southern coastline caused by a herpes virus severely affected in-shore fishing and aquaculture industries across three Australian seaboard states.

Academy President Dr Jim Peacock facilitated the Think Tank. Dr Peacock is a member of Biosecurity Australia's Eminent Scientists Group, a group formed earlier this year to strengthen the import risk analyses process.

Dr Peacock said, 'In addition to increased threats in the tropics from insect-borne human diseases, government agencies like the Queensland Department of Primary Industries and Fisheries have had to deal with the recent citrus canker outbreak, the giant African snail incursion, fire ants and the constant threat of foot and mouth disease'.

He said that wonder drugs such as antibiotics are increasingly coming under pressure from the development of drug-resistant strains of pathogens, while emerging diseases of humans originating from animals (zoonotic diseases) are also on the rise.



Dr Jim Peacock with some Queensland high flyers at the 2004 Think Tank.

'Last year the world threat from deadly SARS (severe acute respiratory syndrome) had authorities struggling to contain the spread of the disease, an outbreak that also had a major impact on the global economy, especially tourism.

'With the avian influenza virus again causing deaths in South-East Asia, the time is right for a multidisciplinary approach to biosecurity by pooling the skills and enthusiasm of fresh young talented minds.'

The Think Tank allowed the younger professionals to hear from some of the nation's eminent experts, such as Professor Mark von Itzstein, Executive Director and Federation Fellow, Institute for Glycomics, Griffith University; Professor Aileen Plant, Head, Centre for

International Health, Curtin University, and Deputy CEO CRC for Biosecurity; Dr Martyn Jeggo, Director, Australian Animal Health Laboratory; Dr Graeme Garner, veterinary scientist, Department of Agriculture, Fisheries and Forestry; Dr John Manners, Deputy CEO, CRC for Tropical Plant Protection; and Dr Brian Jones, Principal Fish Pathologist, Department of Fisheries, WA.

In 2005, the annual High Flyers Think Tank, *Sustainable infrastructure in tropical Australia*, will be held in Darwin.

The proceedings from the Think Tank, including workshop discussions and a final report are available on the Academy's website at www.science.org.au/proceedings/emergingdiseases.

ARC funding for special projects in 2005

The Australian Research Council (ARC), under the Linkage Learned Academies Special Projects scheme, has awarded the Academy \$110,000 to develop a *Strategic Framework for the Population and Environment Nexus: A Whole of Knowledge Approach*. This project will build on the momentum of the successful 2004 Fenner Conference on *Understanding the Population-Environment Debate: Bridging Disciplinary Divides*. A project officer

will work to a steering group chaired by Professor Tony McMichael.

The Academy submitted a second proposal to the ARC on behalf of the National Academies Forum for developing *An Australian Policy Framework for Systemic Assessments of Emerging Risks*. This proposal was funded at the level of \$110,000 and will draw on the broad range of expertise to be found in the four learned academies.

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Recent advances in stem cell science and therapies

In 2005 there will be a review of two Acts of Federal Parliament, the 'Research involving Human Embryos Act 2002' and the 'Prohibition of Human Cloning Act 2002'. These are the two Federal Government Acts that prohibit both reproductive and therapeutic cloning. The review group will report to Parliament and the Council of Australian Governments by December 2005. The review is written into the Act.

Therapeutic cloning is the terminology used to describe the transfer of the nucleus from an adult cell into an empty egg in order to generate self-compatible stem cells, also known as embryonic stem (ES) cells. It is the promise of new cures for degenerative diseases that has stimulated intense research into stem cells.

The Academy has joined 67 of the world's national science academies that make up the InterAcademy Panel

(IAP) in calling for a convention to ban human reproductive cloning but not therapeutic cloning (see IAP's statement at www.nationalacademies.org/iap/iaphome.nsf).

At the United Nations, Australia has co-sponsored a motion proposed by Costa Rica (and the US) to ban all cloning of human embryos, including for stem cell research. Voting on this resolution was put aside in November 2004 when the UN panel adopted a resolution instructing a working group to meet in February to develop a non-binding declaration on human cloning.

The Academy continues to advocate the use of human cells derived from cloning techniques for approved research activities in human biology. On 6 May 2005 the annual *Science at the Shine Dome* symposium will address the topic of recent advances in stem cell science and therapies (www.science.org.au/sats2005/symposium.htm).

International Conference on Population and Development

At the 1994 International Conference on Population and Development (ICPD) held in Egypt, 179 nations created and agreed on a Programme of Action, a 20-year vision which set goals in the areas of sexual and reproductive health, women's empowerment, human rights and resource mobilisation.

A World Leaders' Statement reaffirming the Programme of Action was presented to the United Nations on 14 October 2004—the halfway mark of the implementation plan. The statement was signed by key leaders in the social, scientific and political

sectors, including Academy President Dr Jim Peacock. It is expected that the shared commitment demonstrated by the signatories will help to reinvigorate the momentum and reaffirm the dedication to achieving the ICPD's goals.

The World Leaders' Statement is a project of the Summit Foundation and the UN Foundation on behalf of a number of people and institutions around the world who support the ICPD Programme of Action.

More information is available at www.icpdleadersstatement.net/documents/icpd.htm.

Forthcoming events

- Science at the Shine Dome and AGM, 4-6 May 2005.
See www.science.org.au/sats2005.

New topics on Nova

- The dope on drug-impaired driving.
- Putting on a good face—the chemistry of cosmetics.

www.science.org.au/nova

Basser Library

Anyone wishing to use the Basser Library should contact Rosanne Walker on (02) 6247 9024 or lb@science.org.au.

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.

Recherche Bay: a site of great significance

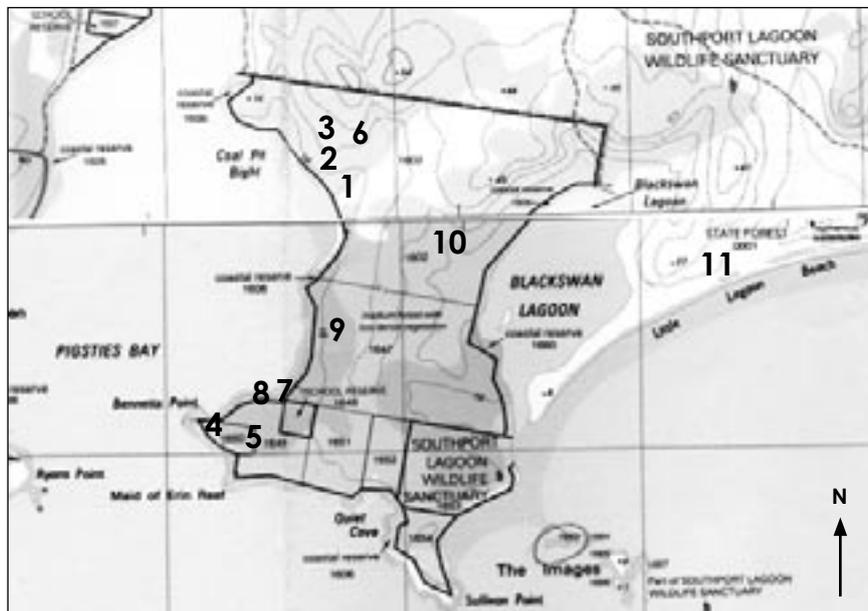
by Dr Hugh Tyndale-Biscoe, FAA

In February 2003 one of the earliest sites of scientific research in Australia was rediscovered, on the north-east peninsula of Recherche Bay, Tasmania. This was where the French Scientific Expedition of 1791-93, under the command of Bruni d'Entrecasteaux, made landfall on 21 April 1792 and named it Recherche Bay, for the flagship. d'Entrecasteaux was so impressed by the beauty and tranquillity of the surroundings that he wrote in his journal:

The trees are of an immense height and proportionate diameter, their branchless trunks covered with evergreen foliage, some looking as old as the world. Nature in all her vigour, yet in a state of decay, seems to offer to the imagination something more picturesque and more imposing than the sight of this same nature bedecked by the hand of civilised man.

During the next month the botanists collected hundreds of hitherto unknown plant species; the hydrographers charted the coast so well that their charts were used for generations; the physicist Rossel carried out his pioneering work on geomagnetism, the astronomers observed the transit of Jupiter's moons; and the gardener, Felix de la Haie, prepared a French kitchen garden and planted the seeds of onions, potatoes, celery and cress.

Nearly a year later, on 20 January 1793, the ships returned to Recherche Bay. The astronomers set up their tents on Bennett's Point and the botanists went across the harbour to the north-east peninsula where they collected over 100 plant species, which are now the type specimens, as well as seeds, which were later grown in the Empress Josephine's garden at Malmaison, near Paris. However, the plants in the kitchen garden had not fared well. Then on 8 February 1793, while working near Southport lagoon, the botanists saw a group of about 40 men, women and children approaching. Observing their friendly behaviour the French put down their weapons and a joyous rapport was established between the two groups. Over the next few days several meetings took place, the highlight being an *al fresco* picnic at the southern end of Black Swan Lagoon, where the two groups engaged



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|---|---|----|--|
| 1 | <i>The laundry</i> | 8 | <i>Forge</i> |
| 2 | <i>Carpenters' shops</i> | 9 | <i>The village area</i> |
| 3 | <i>de la Haie's French kitchen garden</i> | 10 | <i>Labillardière's 'type locality' where he first identified and named plants including Eucalyptus globulus and Epacris impressa: state floral emblems</i> |
| 4 | <i>Observatory</i> | 11 | <i>Athletic carnival with Aborigines</i> |
| 5 | <i>Guard house</i> | | |
| 6 | <i>Duel site</i> | | |
| 7 | <i>Boat repair area</i> | | |

in spear-throwing contests and running races; songs were sung by both parties and dances were joined. The French worked on a large vocabulary of the language and sketched the local people: today these represent the most important description of Tasmanian society at first contact and the most complete vocabulary of their language.

In February 2003 the wall and plinth of what is thought to be de la Haie's garden were rediscovered a short walk through the bush from the beach on Recherche Bay; this has made it possible, by reference to the careful records in the journals of the ship's crew, to fix the positions of several other activities of the French expedition (see map). A separate substantial wall more than 20 metres long and 1 metre high on Bennett's Point, 1 kilometre south of the garden is considered to be Rossel's observatory, where a plaque has been fixed by CSIRO to commemorate his achievements.

When the Academy became aware of this important discovery last year, the President, Dr Jim Peacock, wrote to the then Premier of Tasmania, Jim Bacon, strongly supporting the nomination of the whole of the north-east peninsula of Recherche

Bay for inclusion on the Register of the National Estate. The Premier responded favourably and said the matter would be determined by the Tasmanian Heritage Council. A year later the Council recommended that the whole north-east peninsula, of 144 hectares, should be preserved. However, because the area is privately owned, the State Minister for Heritage, Forests and Tourism, Ken Bacon, felt unable to accede to this and has instead excised a 100-metre strip around the shoreline and the area around the garden and observatory as a reserve, and has granted the owners of the land permission to log the rest of the area. This will mean that the type localities of the plant specimens collected by botanist Labillardière will be lost, as well as the opportunity to find other sites or artefacts from the French occupation of the site. Because these sites have such great significance for the early history of scientific endeavours in Australia and are still in much the same condition as they were 210 years ago, Dr Peacock has written to the current Premier, Paul Lennon, urging him to reconsider this decision and accept the full recommendation of the Tasmanian Heritage Council.

News from our National Committees

On 17 August the **Muses-C Taskforce** of the **Space Science Committee** held a meeting to discuss the recovery in June 2007 of a canister of asteroid dust from the Space Engineering Spacecraft, Hayabusa (which means falcon in Japanese). Hayabusa will map the surface of the asteroid Itokawa for about four months, assessing three possible sampling sites. In December 2005 it will hover like a falcon before pouncing on the surface of the asteroid where it will fire a bullet and then collect the dust that will rise up into a 1-metre funnel. The dust will be collected from Asteroid Itokawa in December 2005. Australia will be assisting with the recovery and safe passage of the canister to Japan.

The **Chemistry Committee** held a teleconference on 25 August and discussed the International Union for Pure and Applied Chemistry's Company Associate Program, the Young Observers' Program and the Union Advisory Committee.

The **Quaternary Research Committee** met on 22 September and discussed the forthcoming conference of the International Union for Quaternary Research to be held in Cairns from 29 July to 6 August, 2007. Planning is well underway and committees have been established.

Planning for the International Geographical Union's Regional Conference, to be held in Brisbane during July-August 2006, was the major agenda item at the **Geography Committee** meeting on 7 October. Maximising the participation of geographers from South-East Asia and the South-West Pacific is one of the challenges facing the conference planners.

Following its meeting in August, the **Chemistry Committee** held a teleconference on 10 November. The *Symposium on green chemistry*, a joint activity of the Committee and Monash University's Centre for Green Chemistry, will be held at the Shine Dome on 20 April 2005.

The **Antarctic Research Committee** together with the Australian Antarctic Division held a very successful conference, *The role of Antarctic research in Australian science and policy advice*, at the Shine Dome on 11-12 November. Australia runs a large and diverse program of scientific research in the Antarctic and in the



From left: Dr Ian Snape (Australian Antarctic Division, Hobart), Belinda Thompson (University of Tasmania), Nicole Hill (University of NSW) and Graeme Clarke (University of NSW) at the Antarctic research conference.



From left: Dr Martin Wild (Swiss Federal Institute of Technology), Dr Roger Gifford (workshop convener), Professor Gerald Stanhill (Volcani Institute, Israel) and Dr John Evans (CRC Greenhouse Accounting, and the Australian National University), at the Pan evaporation workshop.

high (negative) latitude Southern Ocean. This research contributes to the National Research Priorities and supports the government's role in the Antarctic Treaty System. The National Committee met after the conference to discuss the Scientific Committee on Antarctic Research's XXIX international conference, to be held in Hobart in July 2006; and proposed activities for the International Polar Year, 2007-2009.

On 22 November, the **Plant and Animal Sciences Committee** had its inaugural meeting. Academy President, Dr Jim Peacock, attended for part of the meeting. Agenda items included the historic site at Recherche Bay in

southern Tasmania, and the question of whether Australian institutions were training an appropriate mix of future scientists in biology.

The **Earth System Science Committee** held a workshop on *Pan evaporation: An example of the detection and attribution of trends in climate variables* on 22-23 November at the Shine Dome. The workshop was convened by Dr Roger Gifford of CSIRO Plant Industry and was supported by the Australian Greenhouse Office. The workshop brought together Australian and international experts working in the area of climate change.

International news

Australia–China symposium on sustainability

An outcome of a visit to Australia in November 2003 by the President of the Chinese Academy of Sciences, Professor Yongxiang Lu, is a series of Australia–China symposia funded by the Department of Education, Science and Training, the Chinese Academy of Sciences and the National Science Foundation of China.

The first symposium in the series was *Living sustainably—what does this mean for you?* and was held in Lindenderry, Victoria from 17 to 22 October. It was organised by the Academy and the Australian Academy of Technological Sciences and Engineering and convened by Academy Fellows Professor Andrew

Smith and Professor Frank Larkins. Professor Chen Zhu, Vice-President of the Chinese Academy, was the leader of the Chinese delegation.

During the symposium, workshops were held on ecosystem restoration, energy and environment, sustainable agriculture, and water. After the symposium, the Chinese delegation travelled to Adelaide and visited the University of Adelaide, the University of South Australia and the CRC for Water Quality and Treatment.

Feedback from the almost 50 researchers who attended the symposium has been very positive. The Chinese Academy of Sciences will be organising the second workshop, to be held in Beijing in 2005.

Bilateral meetings with China and Japan

The Department of Education, Science and Training organised bilateral meetings with its counterparts in China and Japan on 26–27 August and 30–31 August respectively. Dr Michael Barber, Secretary (Science Policy), was the Academy's representative on the Australian delegation.

The meetings brought together representatives of peak government agencies responsible for science and technology. They also involved leaders from universities, major research organisations and learned academies. Recent collaborative initiatives and future directions for cooperation were discussed.

National Research Council Canada

Academy President, Dr Jim Peacock, hosted a lunch for Dr Michael Raymont, Acting President and Vice-President Technology and Industry Support, National Research Council of Canada on 3 August. Dr Raymont has responsibility for major national programs, including the Industrial Research Assistance Program which provides technology support to industry, universities and various levels of government. The lunch was attended by Fellows of the Academy and provided an opportunity for Dr Raymont and Dr Peacock to discuss research programs and policy issues currently being undertaken in Australia and Canada.

Iraqi delegation

Professor Hussain Al-Shahristani, President of the Iraqi Academy of Sciences, led a higher education delegation to Australia in September. The delegation hoped that their visit would serve as a starting point for discussions amongst various organisations in Australia to develop a comprehensive plan on the role Australian universities could play in reviving Iraq's higher education system. Professor Al-Shahristani met with officers from the Academy, the Department of Education, Science and Training, and CSIRO to discuss higher education and also Iraq's need for assistance in agriculture, particularly in relation to the restoration of the Iraq marshlands.



From left: Liu Zuozhang (Minister Counsellor, Chinese Embassy), Professor Chen Zhu (Vice-President, Chinese Academy of Sciences), Professor Frank Larkins, and Colin Walters (Department of Education, Science and Training).



Symposium participants at the South Australian Research and Development Institute.



At the AGM of the NSW Division of the Royal Australian Chemical Institute, held in Sydney on 14 September, Professor Len Lindoy, FAA, presented the 2004 Le Fèvre Prize to Dr Cameron Kepert, School of Chemistry, University of Sydney. Dr Kepert has an international reputation for his work in materials chemistry. His contributions span inorganic chemistry, agricultural chemistry, manufacturing chemistry and geochemistry.

The Le Fèvre Prize recognises outstanding research in chemistry by scientists under 40 years old and is awarded annually (www.science.org.au/awards/lefevre.htm).

Oliphant Conference on insect robotics

An international workshop on *Insect Sensors and Robotics* was held in Brisbane on August 23-26. Part of the Sir Mark Oliphant International Frontiers of Science and Technology Conference Series, the workshop was convened by Professor Mandyam Srinivasan, FAA, the Director of the Centre for Visual Sciences at the Australian National University.

The workshop was held immediately after the XXII International Congress of Entomology and brought together leading international creative roboticists and biologists who are working on the structure and function of insect sensory and flight motor systems, to design novel, biologically inspired micro UAVs (unmanned aerial vehicles) and legged vehicles for a variety of applications. Examples include novel

sensors for panoramic vision (inspired by insect compound eyes), attitude stabilisation (inspired by insect ocelli and insect halteres), course control (inspired by insect-based sensing of the polarisation pattern of the sky), orientation (based on insect hearing and on infrared reception), and sensing important or dangerous odorants (based on insect antennae). This research is starting to produce important applications in the areas of defence, security, surveillance, disaster response and planetary exploration.

The Oliphant Conference Series is funded by the Department of Education, Science and Training and is managed by the Academy, the Australian Academy of Technological Sciences and Engineering, and Engineers Australia.

www.oliphant.org.au

Boden Research Conference

The Academy recently supported the 3rd International Workshop on Natural Killer T (NKT) cells and CD1 Antigen Presentation as a Boden Research Conference. NKT cells are a minor population of lymphocytes (white blood cells) and play a major role in regulating the vigour and character of a broad range of immune responses. The workshop provided an opportunity for researchers in the field of NKT cell biology to discuss their latest results. It was held on Heron Island, a coral cay, on the Great Barrier Reef.

Andrew Bendelac, University of Chicago, described how NKT cells recognise lipids in microbes. This is important in immune response, because microbes can rapidly evolve their proteins, but not their lipids, in evading immune response.

A number of speakers presented data on immune responses to structural analogues of α -GalCer, a synthetic glycolipid. It is anticipated that at least some of these analogues will find useful applications in the clinical sphere.

'Light and Shadows'

Professor Bruce McKellar, Foreign Secretary, represented the Academy at the Science and Technology in Society Forum—'Light and Shadows'—in Kyoto on 14-16 November. The STS Forum was the brainchild of Mr Koji Omi, former minister for Science and Technology in Japan, and an influential member of the House of Representatives. He modelled it on the Davos World Economic Forum. There were 500 delegates, including 13 ministers for science and/or technology.

The forum opened with a plenary session and speakers included Prime Minister Koizumi, and the ministers for education and/or science and technology from the UK, Russia, Thailand and Italy, a former Prime Minister of Finland and the Chairmen of Pfizer and Toyota. It ended with a very forceful call for action by Jerome Freedman, Nobel Prize winner in Physics 1990, on energy, the environment and the standard of living as linked problems, and on the need to see these and other problems from the point of view of the north and the south.

2004 GRAEME CAUGHLEY TRAVELLING FELLOWSHIP

Snake sex in Canada

by Professor Richard Shine, FAA
Professor of Evolutionary Biology
School of Biological Sciences
University of Sydney

The Academy awarded me the 2004 Graeme Caughley Travelling Fellowship in ecology, to support a trip to North America in May–June 2004. I spent 6–22 May at a field site north of Winnipeg, conducting collaborative fieldwork on garter snake ecology with colleagues from Oregon State University. At first sight, it seems bizarre for an Australian scientist to travel all the way to the frozen prairies of Canada to study snake behaviour—most people imagine that snakes are far more plentiful in Australia. However, the Manitoba system offers extraordinary research opportunities: the ground freezes to such a depth in winter that the local snakes (red-sided garter snakes, *Thamnophis sirtalis parietalis*) must congregate in the few cavities that penetrate below the frostline; and thus, a single hibernation den may contain up to 100,000 snakes. These all emerge over a three-week period in early spring, and mate before dispersing to their feeding ranges (up to 20 kilometres away) and then returning to the same den about four months later, to spend another eight months underground. Thus, the Manitoba dens provide a unique opportunity to study tens of thousands of free-ranging snakes in the midst of their breeding activity. My collaborators and I have exploited that opportunity, with the result that we know more about the operation of sexual selection in this system than in any other reptile species.

At first sight, mating behaviours around the den appear chaotic, with writhing ‘mating balls’ consisting of several (sometimes, hundreds) of amorous male snakes wrapped around a single female. However, experimental trials in outdoor arenas (allowing us to manipulate numbers and body sizes of animals) have revealed remarkable sophistication and complex ‘tactics’ in courting males. For example, males that have just emerged from hibernation—and hence are weak, slow and cold—produce female-like skin pheromones (unsaturated methyl ketones) and thus attract courtship from other males; by duping their

rivals in this way, the ‘she-males’ are protected from attack by predatory crows. As soon as they recover from their long winter inactivity, the ‘she-males’ switch off their transvestite pheromones and begin to act like all the other males. Similar complexity is evident in other aspects of pheromonal communication systems: for example, our experiments show that a single tongue-flick to another snake allows a courting male to determine the other animal’s sex, body length, body condition, and recent mating history.

On my recent trip, we carried out a range of experimental trials to elucidate mate choice criteria by male snakes. My previous work showed that males actively prefer to court



Not even a heavy snowfall can dampen the ardour of male garter snakes in Manitoba. Professor Shine with some of these hardy little animals.

larger rather than smaller females, presumably because the higher litter sizes of larger females provide a greater fitness benefit to a successful mating. This kind of preference for larger females is widespread among reptiles, amphibians and many invertebrate taxa, and may be one of the most widespread criteria for male mate choice in animals overall. I conducted trials to see if this preference was facultative—that is, is the degree of a male’s preference for larger rather than smaller females affected by the size spectra of females he encounters immediately before that courtship event? Accordingly, we kept males with either large or small females, and then tested their courting preferences.

As predicted, male snakes shifted their mate-choice criteria depending upon their recent ‘sampling’ of the sizes of available females.

In combination with our previous results, and with other trials conducted in 2004, these experiments strongly challenge the conventional view that reptiles are behaviourally simple compared to ‘higher’ vertebrates (birds and mammals). It is increasingly apparent that reptiles exhibit remarkably complex patterns of social organisation (including cases of long-term monogamy, nuclear family structure, and the like), that their mate-recognition criteria are extraordinarily sophisticated, and that they flexibly adjust reproductive behaviours to available opportunities. In short, reptiles are not the simple little robots envisaged in earlier research.

Unfortunately, the research has also revealed a dark side to serpent sexuality. Sexual conflict is rife in the den, with males obtaining copulations via force not stimulation. In essence, males prevent females from breathing, and exploit a stress response of near-asphyxiated females (cloacal gaping) to achieve matings. The 2004 fieldwork also addressed one consequence of that system; could the higher mating success of larger (vs smaller) males result from their greater ability to stress females, not (as previously thought) from their ability to defeat their smaller rivals? Indeed, our enclosure trials supported exactly this scenario, suggesting that forcible insemination has provided a significant selective advantage to larger body size in males of this population.

On 22 May I flew from Winnipeg to Illinois to give the Keynote Lecture at the Snake Ecology Group meeting that was held from 23–25 May 2004. I then travelled to the University of Oklahoma (in Norman, Oklahoma) on 26 May to attend the joint annual meeting of the three main herpetological societies worldwide (American Society of Ichthyologists and Herpetologists, Herpetologists’ League, and Society for the Study of Amphibians and Reptiles) from 27 May to 2 June. I presented two invited papers at that conference, and then flew back to Sydney on 8 June.

Information about the Graeme Caughley Travelling Fellowship is available at www.science.org.au/awards.

2004 LLOYD REES LECTURE

Approaching absolute zero

The Lloyd Rees Lecture for 2004 was delivered by Professor Peter Hannaford, FAA, in Melbourne on 22 September on the topic 'The golden jubilee of atomic absorption—approaching absolute zero'.

This was the seventh in the series of biennial lectures to commemorate the life and work of Dr Lloyd Rees, FAA, Foundation Chief of the CSIRO Division of Chemical Physics from 1958 to 1978.

This year's lecture marked the 50th anniversary of the first atomic absorption spectrophotometer and the submission of Sir Alan Walsh's landmark paper on atomic absorption, which revolutionised trace element analysis, providing a quick, easy, accurate and highly sensitive method for determining almost any element in the periodic table.

Professor Hannaford described the conception, development and commercialisation of atomic absorption in the CSIRO Division of Chemical Physics during the period when Lloyd Rees was Chief. He presented a cost-benefit analysis on the economic benefits to Australia and concluded that: 'By far the most important benefits measured were those associated with productivity gains within assaying laboratories... Its principal economic benefit derived from the ability of the method to produce large numbers of assays very rapidly and with high order accuracy.' This component far outweighed the benefits of manufacture and royalties.

Professor Hannaford went on to describe some recent advances in laser cooling techniques which now allow a cloud of atoms to be cooled to

within a few microkelvin of absolute zero. This allows the realisation of an idealised atomic absorption experiment involving quasi-stationary atoms, in which the atomic absorption signal is enhanced by several orders of magnitude and is independent of the strength of the atomic transition.

At microkelvin temperatures atoms behave as waves, and this has led to a new branch of optics—atom optics. Professor Hannaford described some experiments on atom optics, including integrated atom optics on a chip, and ultracold molecules built from ultracold atoms currently being conducted in his laboratory at Swinburne University. He then described how laser cooling techniques together with evaporative cooling, in which the warmer atoms are forced to escape, now enable us to reach temperatures within a nanokelvin of absolute zero, allowing a glimpse into the strange quantum world of 'super' cold atoms. Professor Hannaford concluded the lecture with some potential future applications of ultracold atoms—new generation atomic clocks, quantum computation, atom lithography, gravity and rotation sensors and ultrasensitive trace-isotope analysis.

Professor Hannaford commenced his research career at the CSIRO Division of Chemical Physics during the time Lloyd Rees was Chief and is currently Director of the Centre for Atom Optics and Ultrafast Spectroscopy and the ARC Centre of Excellence for Quantum-Atom Optics at Swinburne University of Technology, Melbourne.



Pictured at the Rees Lecture in Melbourne, from left, Lady Audrey Walsh, Professor Peter Hannaford, Mrs Marion Rees and Chair of the Victorian Regional Fellows Group, Professor Tony Klein.

NOVA: SCIENCE IN THE NEWS

Drug-impaired driving

'The dope on drug-impaired driving' is the latest topic on the Academy's educational website *Nova: Science in the news*.

The posting of the topic is timely, with Victorian police set to begin random roadside drug testing of drivers in December. In this world first, drivers' saliva will be tested for the presence of the active component of cannabis (tetrahydrocannabinol or THC) and methamphetamines (also known as speed, ice and crystal meth).

Other states and territories have introduced legislation which will allow police to randomly test drivers for the presence of drugs.

Depressant drugs such as cannabis can affect driving by slowing reactions and reducing concentration, making it difficult to stay in one lane on the road and being unaware of drifting into the path of oncoming traffic. Stimulant drugs including methamphetamine can make drivers over-confident and aggressive.

The incidence of drug-impaired driving in Australia appears to be quite high. The AAMI Young Drivers Index, published in November, surveyed nearly 2000 young Australian drivers. It found that one in four males admitted to driving under the influence of recreational drugs such as cannabis, speed, cocaine and ecstasy. Interestingly, the survey also found that support for random drug testing was very high (90 per cent), indicating that drivers recognise drug-impaired driving as a dangerous activity.

The topic, available at www.science.org.au/nova, was developed with support from the NRMA-ACT Road Safety Trust. The principal sponsor of Nova is the Commonwealth Bank Foundation.

Primary Connections

St Gregory's Primary School in Queanbeyan was the venue of the announcement in August by Dr Brendan Nelson, Minister for Education, Science and Training, that the Government would provide \$1.8 million for the Academy's Primary Science and Literacy Project. This exciting partnership between the Academy and the Department of Education, Science and Training now has a new name: *Primary Connections—Linking science with literacy*. The name and logo were unveiled by Professor John McKenzie, Secretary (Science Education and Public Awareness), at the Open Session of the Australian Foundation for Science in November.

The project is a mix of innovative new curriculum resources and training support for teachers. The importance of the project is apparent from the collaborative involvement of all states and territories, Catholic Education, independent schools and professional associations.

The curriculum resources will be trialled in about 50 schools across Australia in 2005. Before the trialling starts in the classroom, some 100 primary school teachers will gather



From left: Paul Forde (Principal of St Gregory's Primary School), Gary Nairn (Federal Member for Eden-Monaro), Dr Brendan Nelson (Minister for Education, Science and Training) and Dr Jim Peacock, with students from St Gregory's.

at the Shine Dome for a week-long workshop in January. St Gregory's is one of the schools chosen to trial the new program.

The Academy is pleased to continue its leadership role in supporting and promoting science education in Australia.

Government inquiries: Research infrastructure, a research quality framework and an audit of science skills

The National Collaborative Research Infrastructure Strategy (NCRIS) is providing \$542 million over seven years to provide major facilities for research. The new strategy will take into account the recommendations of the 2003-04 National Infrastructure Task Force review released in March this year and will be informed by an advisory committee. Dr Phil McFadden, FAA, represents the National Academies Forum on the Advisory Committee. A draft Implementation framework document has been released for public comment (www.dest.gov.au/ncris/default.htm). The Academy has a long history of commitment to the development of a cohesive national policy for research infrastructure. Following the consultation and submission

process being run by the Department of Education, Science and Training (DEST), it is intended that a Strategic Roadmap and NCRIS funding guidelines be released in June 2005.

The Government has commenced discussion on a 'Research Quality Framework for Publicly Funded Research'. The first phase of the Framework is to be applied to universities, AIMS, ANSTO and CSIRO. For universities, this discussion may include review of the mode of distribution of funds under the Institutional Grant Scheme, the Research Training Scheme and the Research Infrastructure Block Grant (a total of \$906 million in 2004).

The DEST discussion document is available at www.dest.gov.au/resqual/default.htm. In preparation

for the quality review, the National Academies Forum held a symposium on 'Measuring Excellence in Research and Research Training' in July 2004. The proceedings are available at www.science.org.au/proceedings/researchexcellence.

In August the then Science Minister announced an Audit of Science Skills in Australia. The skills audit is to be undertaken by Government in collaboration with the CSIRO, universities and industry groups. The audit plans to evaluate the supply and demand of graduates from the major scientific disciplines and report on skills shortages in sub-disciplines. The process for the Science Skills Audit is in the early planning phase and terms of reference will be announced in the new year.

Some aspects of the Fellowship

by Professor Frank Fenner, FAA

While working on the history of the Academy, *The First Fifty Years*, it occurred to me that it might be useful to bring some aspects of the Fellowship to the attention of all Fellows via the Newsletter. What follows is dealt with at much greater length in the book, which will be published early in the new year.

The first point of interest is the age of Fellows when elected (Table 1). This abbreviated version of the table shows that in spite of increasing the number of Fellows elected annually from five in 1955 to six in 1959, nine in 1971, twelve

in 1993 and sixteen in 2000, the average age at election has been steadily rising, so that the average age of Fellows elected in the decade 1995 to 2004 (53.5 years) was higher than that of the Foundation Fellows (53.2).

The second point of interest is the geographical distribution of Fellows (Table 2). Here the picture is dominated by the Australian Capital Territory, primarily because of the establishment and growth of the Australian National University, initially and still largely a research-only university. Understandably, Victoria and New

South Wales come next, and then South Australia stands out among the states with smaller populations. However, there has been a healthy increase in the numbers elected in Queensland and Western Australia during the last decade.

Finally, although the Fellowship is overwhelmingly male, since 1991 the situation has improved. Only six women were elected between 1954 and 1990; whereas seventeen were elected between 1991 and 2004; in addition two women have been elected by Special Election, in 2001 and 2004.

Table 1. Age distribution of Fellows by ordinary election at time of election

Age group	1954		1955-1964		1965-1974		1975-1984		1985-1994		1995-2004		1954-2004	
	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%
30-34	2	3.2	0	0.0	1	1.3	0	0.0	1	1.0	0	0.0	4	0.7
35-39	4	6.5	7	12.7	10	13.3	10	11.4	16	16.7	1	0.7	48	9.3
40-44	9	14.5	14	25.5	24	32.0	16	18.2	25	26.0	11	7.9	99	19.1
45-49	15	24.2	14	25.5	22	29.3	22	25.0	30	31.3	27	19.3	130	25.1
50-54	15	24.2	2	21.8	10	13.3	30	34.1	15	15.6	38	22.1	120	23.2
55-59	8	12.9	2	3.6	6	8.0	5	6.7	6	6.3	36	25.7	63	12.2
60-64	2	3.2	5	9.1	2	2.7	4	4.5	2	2.1	21	15.0	36	7.0
65-69	4	6.5	1	1.8	1	2.2	1	1.1	1	1.0	6	4.3	14	2.7
70-74	2	3.2											2	0.4
75-79	1	1.6											1	0.2
Total	62		55		76		88		96		140		517	
Average age	49.5¹		46.8		45.3		48.3		50.9		53.5		49.9	
FF²	53.2													

¹ Calculated from summed ages of individual Fellows.

² Foundation Fellows.

Table 2. The geographical location of ordinary Fellows at the time of their election and comparative population figures

State		1954		1955-1964		1965-1974		1975-1984		1985-1994		1995-2004		Total	
		no.	% ¹	no.	%										
NSW	Fellows	16	25.8	23	41.8	12	16.2	22	26.2	26	29.9	37	26.6	136	27.1; 21.3 ²
	Population ³	3,423,529		3,917,013		4,725,503		5,234,889		5,901,126		6,372,000		6,372,000	
VIC	Fellows	19	30.6	11	20.0	23	31.1	14	16.7	21	24.1	39	28.1	127	25.3; 27.3
	Population	2,452,529		2,930,113		3,601,352		3,946,917		4,427,371		4,645,000		4,645,000	
QLD	Fellows	1	1.6	3	5.4	2	2.7	2	2.4	2	2.3	15	10.8	25	5.0; 6.8
	Population	1,318,259		1,518,828		1,851,485		2,345,208		2,927,004		3,655,000		3,655,000	
SA	Fellows	10	16.0	6	10.9	8	10.8	9	10.7	9	10.3	4	2.9	46	9.2; 31.3
	Population	707,094		969,340		1,200,114		1,318,769		1,456,712		1,467,000		1,467,000	
WA	Fellows	3	4.8	0	0.0	3	4.1	2	2.4	3	3.4	12	8.6	23	4.6; 12.4
	Population	639,771		736,629		1,053,834		1,300,056		1,665,945		1,851,000		1,851,000	
TAS	Fellows	1	1.6	1	1.8	1	1.4	1	1.2	3	3.4	3	2.1	10	2.0; 21.9
	Population	308,752		350,340		398,073		427,224		460,465		457,000		457,000	
ACT	Fellows	12	19.4	11	20.0	25	33.8	34	40.5	23	26.4	29	20.9	134	26.7; 429.5
	Population	30,315		58,828		151,169		227,581		293,531		312,000		312,000	

¹ Percentage of Fellows elected over that period.

² First figure, percentage of all Fellows; second figure, number per million of 2001 population of each state/territory.

³ Population for the census years: 1951, 1961, 1971, 1981, 1991 and 2001.

Colin Austin



Colin Russell Austin was born in Sydney on 12 September 1914 and died in Queensland on 29 June 2004. He was educated at the University of Sydney (BSc 1936, BSc 1938, MSc 1940, DSc 1954) and the University of Cambridge (MA 1967).

He began his career in Australia working as a Research Officer at CSIRO and lecturing at the University of Sydney. He then moved to England, where he spent ten years as a member of the scientific staff of the Medical Research Council in London before accepting the position of Head, Laboratory Animals Division, at the National Institute for Medical Research, London, where he worked from 1958–64. In 1964 he moved to the USA, where he was Head of the Genetic and Developmental Disorders Research Program at the Delta Regional Primate Research Center, Covington, Louisiana as well as Professor of Embryology, Medical School, Tulane University, New Orleans. In addition to these posts, he spent three months each year from 1962–68 as a member of the teaching staff of the Fertilization and Gamete Physiology Training Program at the Marine Biological Laboratory, Woods Hole, Massachusetts. In 1967 he returned to England to take up his final post as Charles Darwin Professor of Animal Embryology at the University of Cambridge, from which he retired in 1981 to live in Buderim, on the Queensland Sunshine Coast.

Austin's work was concerned with mammalian fertilisation. He studied the structure and chemistry of both ova and spermatozoa, including such factors as spermatozoal nucleic acid distribution and the permeability of the egg membranes of various species. His work on penetration of the ovum showed that sperm cannot fertilise the ovum without a period of residence in the female tract, a phenomenon known as capacitation. He also investigated reactions of the ovum during fertilisation and showed that the outer membrane of the egg, known as the zona pellucida, hardens after fertilisation to prevent polyspermy in most mammals. Experiments showed that in the rat and rabbit the number of sperm arriving at the ova at the time of fertilisation is about optimal to produce a high rate of fertilisation with a low

rate of polyspermy (which is fatal to development).

During his career Austin received a number of honours, including the Medal and Citation, 'Lazzaro Spallanzani' Institute for Artificial Insemination and Italian Society for Progress in Zootechny, Milan 1972; Marshall Medal, Society for the Study of Fertility, UK, 1981; Honorary Member, American Association of Anatomists, 1984; and Goding Lecturer, Australian Society for Reproductive Biology 1991. He was elected to the Academy in 1987. He edited the *Journal of Reproduction and Fertility* 1959–64, *Reproduction in Mammals* 1972–86 and *Biological Reviews* 1980–84.

Professor Austin is survived by his wife Patricia and his sons Richard and Mark.

Honours to Fellows

Professor Andrew Cockburn, Australian National University, has received the Royal Australian Ornithologists Union Serventy Medal for 2004. The Serventy Medal recognises excellence in ornithological publication.

Professor Martin Banwell, Australian National University, received the Novartis Chemistry Lectureship for 2004.

Professor Denis Evans, Australian National University, received the 2004 Moyal Medal for research contributions to mathematics, physics or statistics, by the Macquarie University Mathematics Department.

Professor Graeme Clark, Royal Victorian Eye and Ear Hospital, was awarded the 2004 Prime Minister's Prize for Science for pioneering research that led to the production of the cochlear implant. He has also been honoured with the award of 'Australia's Father of the Year' for 2004. More than 25,000 hearing-impaired children around the world have benefited from Professor Clark's dedication to hearing research.

In June 2004 **Professor David Green**, Australian National University, was invited to become an Honorary Fellow of the Mineralogical Society of London. Professor Green was also elected as an Honorary Fellow of the American Geophysical Union.

Professor Keith Nugent, University of Melbourne, has been awarded the 2004 Victoria Prize in recognition of his groundbreaking research into the way we see and measure images using light.

Professor Ross Taylor, Australian National University, has been awarded the Vikram Sarabhai Professorship of the Physical Research Laboratory, Ahmedabad, India. Dr Sarabhai was the Laboratory's founder.

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 Cowley** are Professor John Spence and Professor David Smith. The biographer for **Professor Colin Austin** is Professor Roger Short. Following the death of Dr Brian Robinson, **Dr Harry Minnett's** biographer is now Dr Bruce Thomas.

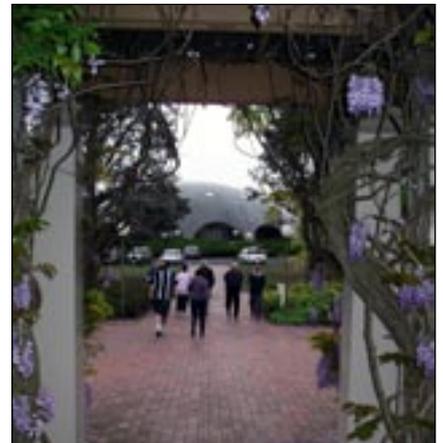
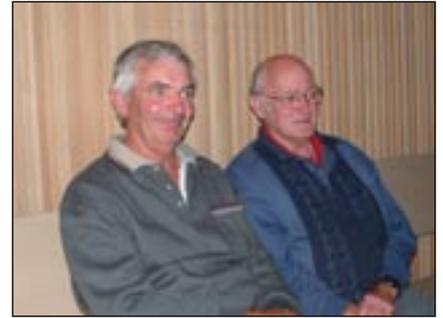
Newsletter online

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CELEBRATING FIFTY YEARS

Academy open day

The Academy held an Open Day on Sunday 17 October as part of its 50th anniversary celebrations. The purpose of the day was to allow the public to explore the Shine Dome and Ian Potter House and to increase awareness of the Academy's activities. More than 200 visitors (including two who had worked on the construction of the Dome) took a guided tour of the Dome and watched a film showing original footage of its construction. On show were the original designs for the Dome site, kitsch memorabilia of the Dome and historical photos. The Jaeger Room of the Dome featured a formal table setting that included candelabras and Wedgwood china. To help create a 1950s atmosphere, Academy staff dressed in 1950s clothes and the FX-FJ Holden Car Club provided cars of the period. Refreshments were served at Ian Potter House and a jazz band provided entertainment.



Clockwise, from above:

Cars from the FX-FJ Holden Car Club viewed from the arches of the Dome.

Bob McCaskill (left) worked on the construction of the Dome as an electrician and John Cashin was a fire alarm contractor.

One of the unsuccessful designs for the Dome site.

The jazz trio at Ian Potter House.

The Jaeger Room.

Walking from Ian Potter House to the Dome.

Academy staff members in their fifties frocks.