AUSTRALIAN ACADEMY OF SCIENCE

NEWSLETTER

September 2007 www.science.org.au Number 69

China–Australia symposium on global ecosystems

Over 40 Australian delegates attended the *Sustaining Global Ecosystems* symposium in Beijing from 8 to10 August, the fourth annual joint symposium with the Chinese Academy of Sciences (CAS).

The symposium, organised by the Academy of Science and the Academy of Technological Sciences and Engineering (ATSE) on behalf of Australian Government Department of Education Science and Training, included five specialised workshops: sustainable water, land, air and energy; and health and the environment.

Approximately 100 Chinese and Australian researchers participated in the event. The Australian delegation was led by Academy President, Professor Kurt Lambeck and ATSE Vice-President, Mr Peter Laver. Professor Bai Chunli, Executive Vice-President of CAS, led the Chinese delegation.

Professor Ian Frazer presented a plenary address, *Sustainable health in the 21st century*. The Australian delegation also attended site visits to the CAS Institute of Biophysics and the CAS Institute of Geographic Sciences and Natural Resources Research.

The aim of the symposium was to bring together senior research scientists from both countries to gain an appreciation of what the other is doing. A range of potential joint research programs were identified, including the opportunity to establish a China–Australia Clean Coal Technology centre.

A joint statement issued by the three academies is available on the Academy website at:

www.science.org.au/reports/14august07.htm

Photo: © Newspix/Mike Keating

Australia and China share in interest in clean coal technology for power generation

A small piece of Australia in Guangzhou

Following a visit to the Australian National Botanic Gardens, Professor Lu Yong Xiang, President of the Chinese Academy of Sciences, asked the Gardens curator Dr Ben Wallace to create an Australian garden of the same style in China. The resulting Australian Garden at the South China Botanic Garden in Guangzhou includes colourful, showy and fragrant plants from the Proteaceae, Myrtaceae, and Fabaceae families, together with ancient 'dinosaur' plants such as ferns, cycads and conifers.

The garden recreates a tropical billabong, shrubby woodland, rainforest and a rock garden. Several feral Australian species of Eucalyptus and Acacia were retained to provide some shelter. The climate in Guangzhou limited the plantings to tropical and subtropical species. Plants were obtained from a combination of existing plants that were scattered through the Gardens, local Guangzhou commercial nurseries and Australian sources.

The Botanical Institute at the South China Botanic Gardens was keen to include aboriginal cultural features in the thematic structure and interpretation. Although naturalistic in style, some abstracted features also appear in the garden. They include the Southern Cross Fountain at the front entrance; an obelisk surmounted by a growing strangler fig; a 'sea of grass' in the shape of a boomerang and representations of a midden, gunyas, and a bora ring.

Theme signs and plant labels have been provided for use with educative programs such as school classes or special interest groups.

Photo: © Ben Wallace

Ben Wallace describes the finer points of the planting scheme to Professor Lu

Photo: © Ben Wallace

A showy *Xanthostemon youngiana* is one of the 300 types of plant in the garden

Published by the Australian Academy of Science
GPO Box 783
Canberra ACT 2601

www.science.org.au

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

Email: aas@science.org.au

Honorary editor:
Professor Neville Fletcher FAA

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

ISSN 1031-9204

Gifts to the Academy

If you would like to make a gift or a bequest to the Academy, please contact the Executive Secretary, Professor Sue Serjeantson, on (02) 6201 9400 or **es@science.org.au**

Research and innovation in Australia: a policy statement

The Academy of Science's 2007 policy statement *Research and Innovation in Australia* identifies ten actions that Australia must take to maintain a strategic economic position in a world where many other nations have a competitive advantage. The recommendations aim to increase the chances of the nation realising its potential as a major contributor to a global, knowledge-based economy.

In a world where information is only a click away, the competitiveness of nations such as Australia will be tested increasingly by a new world order. The Academy contends that Australia's future socioeconomic and environmental prosperity will be underpinned by science, technology and innovation.

Without urgent attention to education, research and innovation policies, Australia may find its current advantages in the international market-place rapidly eroded. Alternatively, strategic investment in science, technology and innovation will open up new and exciting opportunities to strengthen the quality of life for all Australians. The policy statement *Research and Innovation in Australia* is available at: **www.science.org.au/reports**

Forthcoming events

11 October: Shine Dome Open Day, Canberra.
www.science.org.au/2007openday

30 October: Sixth annual High Flyers Think Tank 2007 – *Extreme natural events*, University of Melbourne.

2–5 December: Fenner Conference – *Wildlife population dynamics and management*, The Shine Dome, Canberra.

Important dates in 2007

8 September: Orientation Day for Korean Postdoctoral Fellows, Canberra.

24–26 September: InterAcademy Panel Executive meeting, Canberra.

26 September: Address by the Academy President Professor Kurt Lambeck at the National Press Club, Canberra.

4 October: Australian Foundation for Science AGM, Canberra.

23 November: International Council of Scientific Unions Asia Pacific Regional Meeting.

28–29 November: Federation of Asian Scientific Academies and Societies Committee Meeting.

Academy farewell

The Academy's Business Manager, Pam Ferrar, retired on 13 July. The President joined Academy staff at the Hyatt in Canberra to farewell Pam over high tea. Pam hopes to improve her golf score card, complete a book and do research on her family's history. We wish her all the best in her second retirement.

International news

Visit to Taiwan

The Academy's counterpart in Taiwan, the National Science Council, hosted a visit by Nancy Pritchard, Manager-International Programs, from 13 to 16 August. The Council organised a program of visits in Taipei, Hsinchu and Tainan, including the National Synchrotron Radiation Research Center, the National Center for High-Performance Computing, the National Health Research Institutes and the National Digital Archives Program of the Academia Sinica. Meetings were also held with the Australian Commerce and Industry Office in Taipei. The Academy has a program of exchange visits to Taiwan, and it is hoped that this visit will raise the profile of the program.

Australian COST participation

The Academy manages, on behalf of Australian Government Department of Education Science and Training, the Australian participation in European Cooperation in the field of Scientific and Technical Research (COST) program.

The role of COST is to develop European scientific endeavours in key areas of knowledge, establish networks of leading scientists, to increase the mobility of research workers across Europe and to improve cooperation in science and technology.

COST will support a total of twenty Australian researchers over two years in the priority areas of medical and health research; agriculture, biotechnology and food; nanotechnology; information and communications technology; and environment and climate change. The Academy is calling for applications for this program from Australian researchers. For more information contact Nancy Pritchard on 02 6201 9411 or go to: **www.science.org.au/internat/cost.htm**

Extending connections to secondary school science

In July the Academy welcomed the news that the *Science by Doing: Secondary Connections* pilot program had received funding from the Australian Government Department of Education, Science and Training.

Declining student participation rates in science and an increasing demand from the Australian and international economies for a scientific literate workforce indicate the need for a new approach to the teaching and learning of science in secondary schools. The *Science by Doing* project seeks to address the reasons for student disengagement and to improve student understanding of and participation in science.

The Academy has identified three essential elements necessary to improve secondary students' engagement with science. The elements are:

- the development of a professional learning approach for teachers
- the development and delivery of professional learning resources for teachers
- the development and publication of inquiry-based instructional units.

Science by Doing aims to change science education in Australian secondary schools and develop students' scientific literacy. To do this, *Science by Doing* promotes:

- a science curriculum that is relevant to the needs, concerns and personal experiences of students
- teaching and learning of science that is centred on inquiry: students investigate, construct and test ideas about the natural world
- assessment embedded in the instructional units, that serves the purpose of learning and is consistent with and complementary to good teaching
- a teaching–learning environment characterised by enjoyment, fulfilment and engagement in learning.

Photo: © Newspex/Braden Fastier

Students engage in web-based learning activities

The Academy is conducting a pilot of *Science by Doing* until June 2008. Professional learning resources and three web-based instructional units will be developed. A training program including professional learning for teachers participating in the trial will be conducted in January 2008. The trained cohort of secondary science teachers from around Australia will then trial the materials and teaching methods with their students. Feedback from teachers and students will be critical to determine how to implement *Science by Doing* in schools. For more information contact Richard John on 02 6201 9454 or email **richard.john@science.org.au**

ScienceByDoing SecondaryConnections

The White Conference 2007

The 2007 Elizabeth and Frederick White Research Conference, *The Magellanic System*, was held at the Australia Telescope National Facility headquarters in Sydney on 16 and 17 July. Sixty delegates from around the world, including six international keynote speakers funded by the Academy, met for the two-day conference to discuss recently discovered and updated properties of the Magellanic system.

The Magellanic system is one of the best places to study the formation and evolution of galaxies, being made up of the large and small Magellanic clouds orbiting each other, with a bridge of dust and gas between them, and a prominent tidal tail.

The conference provoked both intense interest and scepticism. Theories, radio, optical, mm and sub-mm results were presented and discussed. Controversial topics, such as the formation and evolution of the Magellanic stream and the motion measurements of the Magellanic clouds, were vigorously debated by the Australian and international experts. The White Conference, in bringing together experts with a wide variety of approaches to studying the system, contributed greatly to the further development of a global picture and understanding of the system. For more information go to: **www.atnf.csiro.au/research/LVmeeting/mag_program.html**

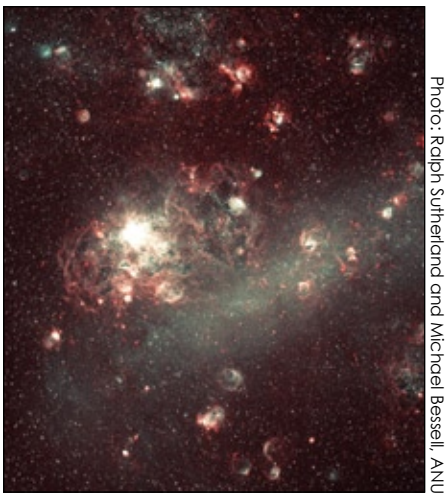

Photo: Ralph Sutherland and Michael Bessell, ANU

Large Magellanic cloud: star forming regions glow red and young stars are blue

Nova: Science in the news

There are two new topics on the Academy's educational website, *Nova: Science in the news:* **www.science.org.au**

Sounding out the secrets of the sea

The increasing use of sound by humans to explore the seas has raised questions about its potential impact on marine life.

Sound under water is very important for animals. It allows them to navigate, to communicate and to detect approaching predators and prey. Marine animals have evolved a variety of ways to detect and make sound in water. Marine animals rely upon sensory hairs to detect sound, though with differences between species. Whales and dolphins have evolved to use sonar (SOund NAvigation and Ranging) or echolocation to produce and detect sound. The animal produces a very short high frequency 'click' by passing air through vibrating 'lips' in their head.

The potential impacts of sonar on marine animals are similar to those of humans exposed to noise, which include behavioural changes and temporary or permanent hearing loss. It is not always easy to determine whether an animal is harmed by exposure to a sound. But scientists have come up with new ways, including a digital tag to study the behaviour of marine mammals upon exposure to different sound sources.

This topic is sponsored by the Australian Acoustical Society (**www.acoustics.asn.au/index.php**).

Quantum computers – why would you want one?

Do we really need even faster computers? The computers we have already go at blinding speed and can do pretty much whatever we want. Yet we have always been able to find ways to use each step-up in computer power as it has been presented.

Supercomputers, which usually take up a whole room are already in demand for things like forecasting weather and climate. Yet something called a quantum computer is emerging which could give everyone that sort of grunt on their desktop.

One much-discussed need for a really slick computer is cryptography or code-cracking. With today's computers this takes just about forever, so we can rely on such encryptions to keep our money safe. But it seems quantum computers could crack them within a few hours or even a few minutes. What then? Even tougher codes that will need even faster computers?

This topic is sponsored by the Sir Mark Oliphant Conferences - International Frontiers of Science and Technology (**www.oliphant.org.au**). The Australian Foundation for Science is also a supporter of *Nova*.

Photo: © Stockxpert/Alex Bramwell

Shh...can you hear the secrets of the sea?

Photo: © Stockxpert/Lily Rosen

Leaping into the world of quantum computing

Bonding on Heron Island: Boden Conference 2007

The role of disulfide bonds in protein folding and function was the focus of discussion at the Boden Conference 2007, held from 29 July to 2 August at Heron Island on the Great Barrier Reef. The conference attracted world leaders in disulfide bond research, including invited speakers from Japan, the USA, Switzerland, Germany and Australia.

Conference sessions covered a range of topics related to disulfide bonding, including the role of disulfide bonds in structural biology, diseases, proteins and peptides, and new innovations in disulfide redox biology and chemistry.

The large international representation provided a novel opportunity for Australian research leaders and early-career researchers to meet and network with international leaders in the fast-growing field surrounding disulfide bonds, and a number of new international and national collaborations are expected as an outcome of the meeting. Early-career researchers and Australian-based PhD students were given an additional opportunity to highlight their research in a Young Investigator session, which was included in the conference program along with a number of lively discussion and debate sessions on specific controversies in the field.

Conference attendees take a break from proceedings

Feedback from delegates has been overwhelmingly positive, with a particular emphasis on the effective cocktail mixture of tropical atmosphere, formal and informal discussion opportunities and contribution of research leaders from around the world. For more information go to: **www.imb.uq.edu.au/index.html?page=55595&pid=31137**

Safeguarding Australia

The first in the *Safeguarding Australia* series of lectures was held on 7 August at the Shine Dome. The speaker was Dr Mike Nunn, Principal Scientist (Animal Biosecurity) from Biosecurity Australia, Australian Government Department of Agriculture, Fisheries and Forestry. He explored some recent examples of emerging diseases and how scientific and technological advances are being used to help safeguard Australia from such diseases. Transcripts from the *Safeguarding Australia* series will be available from: **www.science.org.au/events/publiclectures/sa/transcripts.htm**

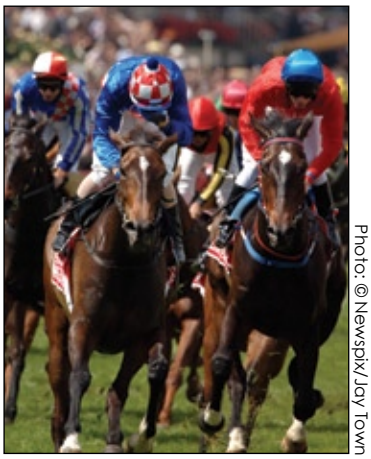

Photo: © Newspix/Jay Town

Equine influenza threatens the race that stops the nation

Student prize

The National Museum of Australia and the Academy, through its National Committee for History and Philosophy of Science, invite submissions for the National Museum of Australia Student Prize for the History of Australian Science 2008.

The prize certificate and $2,500 will be awarded for original unpublished research undertaken whilst enrolled as a student (postgraduate or undergraduate) at any tertiary educational institution. Essays may deal with any aspect of the history of Australian science. The winning entry may be considered for publication in *Historical Records of Australian Science*. The closing date for submissions is 28 February 2008. Please direct inquiries to Rosanne Walker (**rosanne.walker@science.org.au**).

Register to receive email alerts about the Academy's public events, including this lecture series, or read transcripts of the lectures at: **www.science.org.au/events/publiclectures**

interviews with Australian scientists

The taped interviews with 100 Australian scientists are now available on DVD. The interviews record the inspiration, frustration and triumph that are part of a life in science. A complete list of interviews and order details are available from: **www.science.org.au/scientists**

If you would like to nominate a scientist to be interviewed, please contact Maggie Percival on 02 6201 9417 or **maggie.percival@science.org.au**

News from National Committees

Australian presidents

Australian scientist Dr Tom Beer of CSIRO was elected President of the International Union of Geodesy and Geophysics (IUGG) at the recent General Assembly held in Perugia, Italy. The IUGG Council also voted to hold the 25th General Assembly in Melbourne in 2011.

Professor Robert Vincent FAA, Chair of the National Committee for Antarctic Research, was elected President of the Scientific Committee for Solar-Terrestrial Physics at the General Council Meeting, also held in Perugia, Italy on 8 July.

The new President of the International Union of Biological Sciences is Australian Professor John Buckeridge of RMIT University, Melbourne.

New national committee

Council moved to disband the National Committee for Psychology at the June meeting, and created a new committee, the National Committee for Brain and Mind, under the leadership of Professor Max Coltheart FAA.

Mechanical sciences

The National Committee for Mechanical Sciences has a new Chair: Associate Professor Jim Denier replaces Dr Francis Rose, who recently retired.

Plant and animal sciences

The National Committee for Plant and Animal Sciences met in Canberra on 26 June. Points for discussion included a potential Future Biological Map of Australia, a bid to host the 2013 International Grasslands Congress in Australia, and outcomes of the recent International Union of Biological Sciences General Assembly.

Participants of the *Vegetation Dynamics and Climate Change* workshop

Members of the National Committee for Earth Sciences

Astronomy

On 3 July the National Committee for Astronomy met at Macquarie University, coinciding with the annual conference of the Astronomical Society of Australia. The committee met with the heads of astronomy departments for the first part of the meeting. Astronomy Australia Limited (AAL) was a focus of discussion. AAL is a not-for-profit company created as part of the National Collaborative Research Infrastructure Strategy (NCRIS) process, which manages programs that provide astronomers with access to national optical/infrared and radio astronomy infrastructure. The International Year of Astronomy 2009 and Australian Square Kilometre Array Pathfinder funding were also considered.

Earth sciences

The National Committee for Earth Sciences met in Canberra on 20 July. Discussion included an update on the establishment of AuScope. Funded through NCRIS, the AuScope Project will organise and administer a National Earth Science Infrastructure Program from 2007 to 2011. The National Geoscience Transects program, International Year of Planet Earth 2008, the state of university earth science departments and outcomes of the 2007 International Union of Geodesy and Geophysics General Assembly were also discussed.

History and philosophy of science

The National Committee for History and Philosophy of Science met by teleconference on 8 August. The National Museum of Australia student essay prizes, the Research Quality Framework journal ranking exercise, the status of university history and philosophy of science programs following restructurings, and the upcoming International Society for History, Philosophy, and Social Studies of Biology meeting in Brisbane, July 2009, were discussed.

Earth system science

The National Committee for Earth System Science arranged a workshop to prioritise research beyond the Blueprint for Australian Terrestrial Carbon Cycle Research, titled *Vegetation Dynamics and Climate Change*. The workshop was held at the Shine Dome on 14 and 15 August, with the support of the Academy, the Global Carbon Project and the Australian Greenhouse Office. The outcomes of the workshop will be posted at: **www.globalcarbonproject.org/meetings/VegetationDynamics.htm**

Lindau meeting

The Academy supported six young scientists to attend the 2007 meeting of Nobel Laureates, held in Lindau, Germany from 1 to 6 July. The 2007 meeting was for researchers and laureates in physiology or medicine. The delegation was accompanied by Professor Bob Williamson FAA.

Honours to Fellows

Professor Gavin Brown was elected as a Corresponding Fellow to the Royal Society of Edinburgh in March 2007.

Professor Ian Frazer has been awarded a 2007 ATSE Clunies Ross Award.

Professor Nancy Millis has been awarded the 2007 ATSE Lifetime Achievement Award. **www.cluniesross.org.au/index.php?sectionid=147**

Professor Chennupati Jagadish has been elected to the Fellowship of the Institution of Engineering and Technology.

Five Australian Fellowships

Five Academy Fellows recently received inaugural Australian Fellowships through the National Health and Medical Research Council, awarded to researchers in cancer, infectious diseases and mental health. Included in the list of nine recipients of $4 million each are the following Fellows:

The fight against cancer: **Professor Doug Hilton, Professor David Vaux** and **Dr Andreas Strasser**

Easing the global burden of infectious diseases: **Professor Alan Cowman**

Mind and body – moving forward on mental health: **Professor Sam Berkovic**

Scientist honoured for Alzheimer's research

The neuroscientist who found the molecular key to unlocking Alzheimer's disease has won Victoria's most prestigious science award, the Victoria Prize. **Laureate Professor Colin Masters**, one of the world's foremost neuroscientists, was presented with the 10th Victoria Prize on 16 August by the Governor of Victoria, **Professor David de Kretser**.

Colin Masters won the $50,000 prize for his achievements in isolating and characterising elements of the primary pathway causing Alzheimer's disease.

Australian Thinker of the Year

This year's winner of the Australian Thinker of the year award is **Professor Jenny Graves** of the Australian National University and Melbourne University. Jenny Graves is known for her comparative genomics research and declaring that the Y chromosome will become extinct, and is celebrated as a role model to women scientists and an inspiration to students of genetics.

Eureka!

The contributions to Australian science of two Academy Fellows, **Professor Max Coltheart** and **Professor Terry Hughes**, has been recognised through the national science awards, the Australian Museum Eureka Prizes.

Max Coltheart, one of the world's leading cognitive scientists, has been awarded the 2007 CSIRO Eureka Prize for Leadership in Science.

The Sherman Eureka Prize for Environmental Research was awarded to Terry Hughes, Director of the ARC Centre of Excellence for Coral Reef Studies.

Fellow turns 90

Best wishes to Peter Bishop, who turned 90 on 14 June. He was born in Tamworth and studied medicine at the University of Sydney. He found the brain dissections so fascinating that he spent his entire career studying this organ, specialising in binocular vision using cats as his subjects. He was also very attracted to engineering and used his skills in this area to make much of his own equipment. After 17 years at the University of Sydney, where he was Professor and Head of the Department of Physiology from 1955 to 1967 he moved to the John Curtin School of the ANU as Professor and Head of the Department of Physiology, where he remained until his retirement in 1982. A Fellow of both this Academy (1967) and the Royal Society (1977), Peter shared the Australia Prize in 1993. He attributes his success to hard work – he worked four or five days a week from 9am to midnight – and to his very supportive wife Hilare.

Shine Dome Open Day

On **Thursday 11 October** the Academy will open the doors of the Shine Dome to the public. Visitors will be able to:

- watch original film footage of the Dome's construction
- explore the building and its collection of artefacts
- join guided tours and hear about the first 50 years of the Dome
- experience the architectural enterprise of the Dome's construction

The Dome is located on Gordon Street in Canberra and will be open from 10am to 3pm. For more information or to make a tour booking contact Maggie Percival on 02 6201 9417 or **maggie.percival@science.org.au**

Stamp of approval for Dome

The Academy's Shine Dome has been selected as one of four iconic buildings of the mid 20th century to feature on the Australia Post stamp issue *Landmarks: Australian Modernist Architecture*.

Speaking at the Academy's celebratory gathering in July, President Kurt Lambeck was delighted that the Dome is considered among the most innovative examples of modernist architecture in Australia. He added that the Dome's importance extends beyond its architectural structure: 'For me, the Dome is a landmark for the Academy, and for excellence in science, that has served us well and will continue to do so for many years to come.'

Image: © Australia Post

Primary Connections powers on

Australian Awards for Excellence in Educational Publishing

Primary Connections was short listed for the Australian Awards for Excellence in Educational Publishing for the second consecutive year. *Primary Connections* and the other short listed publications were recognised as being among the best of all publications nominated for these awards over the past 14 years. This year's entry consisted of the second set of published units; *On the move*, *Water works* and *Spinning in space*.

Pre-service educators workshop

Based on the success of the two-day *Primary Connections* Pre-service Educators workshop held in February 2007, the Department of Education, Science and Training requested a repeat of this workshop. The *Primary Connections* team was delighted to invite 60 tertiary educators to Canberra on 20 to 21 July to introduce them to the principles that underpin the program.

There has been a lot of interest in the program from pre-service teachers as they explore inquiry-based approaches and prepare for practicum teaching. Several universities have been granted rights under the Education Use Licence to make the *Questioning Minds* DVD available to students from their university websites.

Photo: ©Irene Dowdy

Students from Narrabundah Primary School make electrical connections

Latest resources

The rate of sales of the *Primary Connections* curriculum resources is a testament to the quality of the program, remembering that it is not only about the books, but also an approach to teaching and learning.

There are currently seven units available for purchase. The next two units to be published are *It's electrifying* and *Package it better*, both for stage 3. A further six units have been written for trial in 2007 and are to be published in 2008. A complete list of published units is available from: **www.science.org.au/primaryconnections/additional.htm**

Special thanks

Fellows of the Academy have been very generous with their time in ensuring the accuracy of the science content in our units. Special thanks to Professor Tony Klein FAA for his continued support in this capacity.

Launching into a very bright future for physics

The Academy hosted a combined event at the Shine Dome on 6 June to launch the first in the latest series of public lectures, *Physics for the Future*, and a ten-year plan for the Australian Synchrotron. The combined event highlighted an exciting future for Australian researchers involved in quantum optics and synchrotron science.

Physics is behind many aspects of our lives including communication, entertainment, manufacturing and health. The plan for the Australian Synchrotron was two years in the making and identifies opportunities for major advances in structural biology, medical imaging and therapy, pharmaceuticals, minerals processing and materials science, to name just a few. The plan was released by Federation Fellow Professor Keith Nugent FAA.

Photo: © Newspix

Fibre optics: used everyday in communications

The release of the plan coincides with and complements the first in a series of public lectures presented by leading Australian physicists. *Photons – quantum ideas that could influence your life* was presented by Professor Hans Bachor, Director of the ARC Centre of Excellence for Quantum-Atom Optics. Hans Bachor traced the history of the photon and some of the people behind this scientific adventure, and showed some of the new ideas that are currently being explored in research labs.

The second lecture in the series was given by Professor Mike Dopita FAA on 23 August as part of the National Science Festival. *The (not so secret) lives of galaxies* traced the often violent life cycle of galaxies to explain how galaxies are formed, how black holes grow and what happens when galaxies collide. The *Physics for the Future* presentations are available from: **www.futurephysics.info/Future%20Physics/Lecture%20Archive.html**