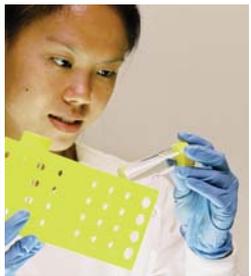


Australian science stories

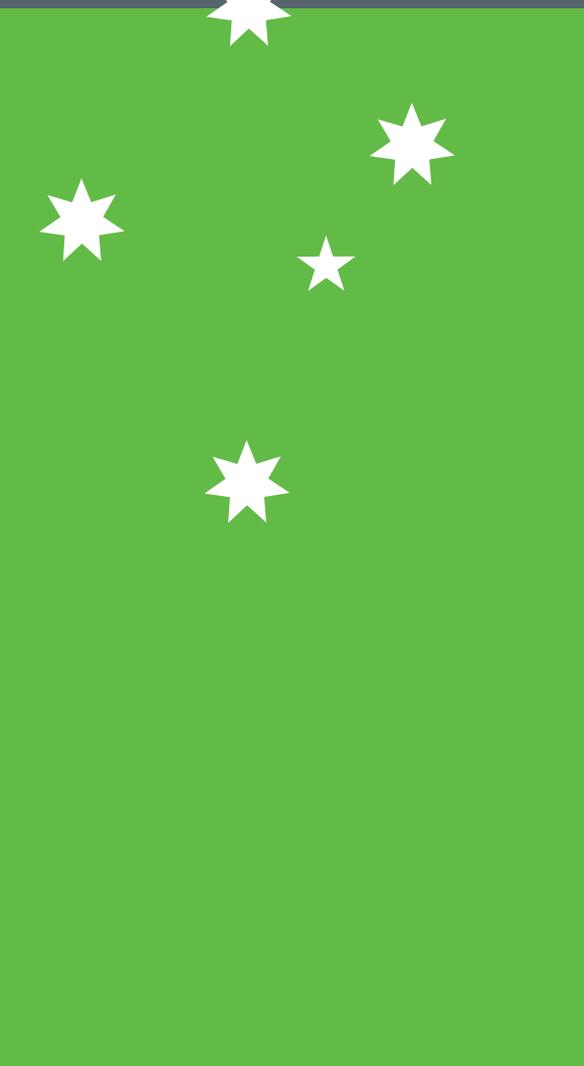


5TH WORLD CONFERENCE OF
science
journalists



2007

AUSTRALIA 2007...SCIENCE STORIES FROM AUSTRALIA 2007...



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welcome

Welcome to our collection of Australian science stories, prepared for the 5th World Conference of Science Journalists, Melbourne Australia.

Over the last two years as we developed our plans for our conference, we briefed journalists in Seoul, London, Budapest, Munich, St Louis, Prague, Washington, Ottawa and San Francisco. Everywhere we've discovered that science journalists have a healthy appetite for Australian science stories and Australian wine.

What is it about Australian science that appeals? I think Leigh Dayton, from The Australian newspaper, captures the essence.

I was captivated by Australia after my first visit Down Under.

Given a geological history that left it sailing off on its own, the continent was a scientific laboratory everywhere I looked.

Plants, animals and people all had proceeded down different evolutionary paths than those followed by their northern hemisphere 'cousins'.

Look up. The skies are different, so is the climate, not to mention many atmospheric issues. Compared to North America – my home base – Australia's a hop-skip-and-a-jump to the driest and most remote continent on earth, Antarctica.

While unique, the broader aspects of each of these fields, and numerous others, complement scientific findings and technological developments elsewhere.

In fact, critical data about many of the hottest scientific questions today – from human origins and migrations to 'management' of global warming – may well be answered, courtesy of Australian researchers and the land itself.

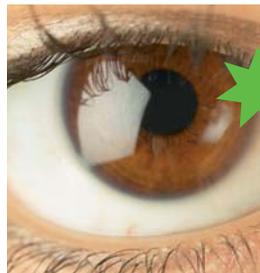
For this collection, we invited Australian research organisations to contribute snapshots of some of their current research. The stories illustrate the breadth and depth of Australian science. And the funds raised in publishing this collection of stories have also helped support the participation of developing country journalists in the conference.

I invite you to read these stories and to follow up with any organisation whose work captures your interest.



Niall Byrne

Director,
5th World Conference of Science Journalists



Concept
Niall Byrne

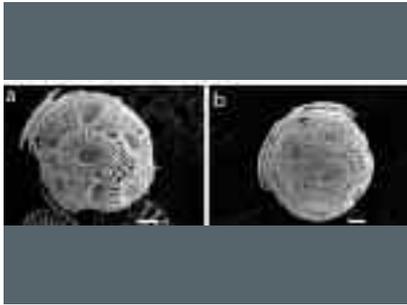
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For more information about this publication email niall@scienceinpublic.com, phone +61 3 9397 3980



THE *COCCLITHOPHORID EMILIANA HUXLEYI* – A MEMBER OF THE MOST ABUNDANT GROUP OF ALGAE – SHOWING A HEALTHY CELL (RIGHT) AND INCOMPLETE GROWTH CAUSED BY INCREASING OCEAN ACIDITY (LEFT)

Ocean acidification threatens marine ecosystems

Ocean acidification, caused by increasing amounts of atmospheric carbon dioxide dissolving in the ocean, poses a serious threat to marine ecosystems.

Increasing acidity affects the ability of some planktonic organisms to form shells, and is expected to change the species composition of plankton, with flow-on effects to higher levels of the food web.

Scientists at the Australian Antarctic Division and Antarctic Climate and Ecosystems Cooperative Research Centre have been studying the effects of ocean acidification on shell-forming, planktonic organisms, during research voyages to the Southern Ocean.

In recent shipboard experiments, planktonic communities were incubated in 650 litre 'minicosm' tanks, under carbon dioxide concentrations ranging from one to four times present-day levels. Responses of phytoplankton, protozoa, bacteria and viruses were measured both at the cellular and community levels, and are currently being analysed.

Early results from laboratory experiments indicate that increasing levels of carbon dioxide significantly affect the structural integrity of shell-forming plankton.

For more information: Australian Antarctic Division and Antarctic Climate and Ecosystems Cooperative Research Centre, Simon Wright, Tel: +61 3 6232 3338, simon.wright@aad.gov.au



A TAMMAR WALLABY LOOKING INTO THE FUTURE OF GENETICS

The kangaroo genome – marsupials filling the gap

Analysing the genomes of Australia's iconic marsupials will provide insight into how they turn off and on the development of the early embryo; give birth to very underdeveloped young, and why marsupial milk changes radically over the months of lactation.

This knowledge could lead scientists to new treatments for premature births, better milk production in cows, as well as novel antibiotics.

Marsupials fill an evolutionary gap between the distantly related birds/reptiles and the more closely related placental mammals (such as humans and cows).

The Tammar wallaby (a member of the kangaroo family) has been the subject of many classic genetic, physiological, developmental and ecological studies by marsupial researchers in Australia.

Now the Australian Genome Research Facility (AGRF) has partnered with the National Institutes of Health (USA) to sequence the genome of Tammar wallaby.

Comparing the wallaby genome with other organisms enables scientists to identify regions of similarity and difference, which can provide clues about the structure and functions of genes invaluable to health and agricultural research.

For more information: Australian Genome Research Facility (AGRF), Elizabeth Kuczek, Tel: +61 7 3365 4392 e.kuczek@agr.org.au



THE OPAL REACTOR AND ITS NEUTRON BEAM INSTRUMENT FACILITY RANKED IN THE WORLD'S TOP-THREE

Australia's new reactor opens

The OPAL reactor and new neutron beam facility, managed by the Australian Nuclear Science and Technology Organisation (ANSTO) in Sydney's south, officially opens on Wednesday 18 April 2007.

Costing \$400 million to build, the reactor was described by ANSTO's Executive Director, Dr. Ian Smith as "the jewel in the crown" of Australian nuclear research.

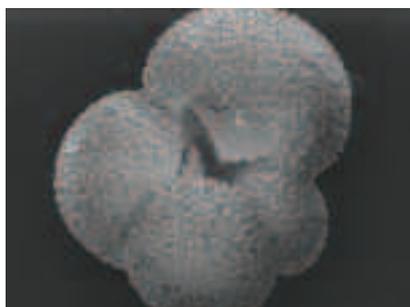
"The OPAL reactor and its neutron beam instrument facility will rank it as one of the top three research reactors in the world," he said.

"The OPAL facility is already attracting major interest from local and international scientists and will promote great scientific growth," said Dr. Smith.

The new instruments at OPAL will help scientists to analyse materials at the atomic level and help gain more understanding, for example, of essential biological processes in the body, how to improve manufacturing methods or how to better store food in order to prolong shelf life.

The OPAL reactor will also allow ANSTO to continue to provide half a million nuclear medicines a year to Australians and irradiate silicon for the semiconductor industry.

For more information: Australian Nuclear Science and Technology Organisation (ANSTO), Dr. Ian Smith, Tel: +61 2 9717 9575, www.ansto.gov.au



SCANNING ELECTRON MICROGRAPH OF THE SOUTHERN OCEAN PLANKTON *GLOBIGERINA BULLOIDES* – PHOTO COURTESY: WILLIAM R. HOWARD AND ANDREW MOY, ANTARCTIC CLIMATE & ECOSYSTEMS COOPERATIVE RESEARCH CENTRE

Carbon dioxide bad news for ocean critters

Rising carbon dioxide in the atmosphere is causing ocean acidification, leading to adverse impacts on shell-forming organisms such as sea urchins, cold water corals and plankton.

Around half of carbon dioxide generated by human activities such as burning fossil fuels is now stored in the world's oceans, particularly the colder Southern Ocean surrounding Antarctica. This increases the acidity of the ocean, which limits the ability of marine organisms to form shells and other external structures.

Scientists at the Antarctic Climate and Ecosystems CRC in Hobart are studying a shell-forming variety of plankton about the size of a sand grain to find out the effects of carbon dioxide fluctuations in the geological past.

They have found shells are lighter at times of high atmospheric carbon dioxide concentration, suggesting that shell-forming organisms in the Southern Ocean have already begun to experience the impacts of ocean acidification.

For more information: Australian Greenhouse Office, Andrea Mettenmeyer, Tel: +61 2 6274 1859, communications@greenhouse.gov.au



HEAP LEACHING AT ESCONDIDA

Bacteria: The mining powerhouse of the future

BHP Billiton, the world's largest diversified resources company, is focused on developing bioleaching technology to recover metals from difficult-to-treat concentrates or low-grade ores.

A relatively inexpensive method – bio-assisted leaching – relies on using adapted microbial cultures that catalyse mineral leaching. These diverse bacterial cultures treat low-grade ores, which is important in the face of high-grade ore depletion. It also has an environmental upside: eliminating crushing, grinding and flotation in the production process reduces energy consumption.

Primary copper sulphide ores are notoriously difficult to leach in acid media due to the high content of chalcopyrite, a mineral that is refractory to acid leaching at ambient temperatures and pressures less than 100kPa. Bio-assisted leaching at temperatures above 50°C and up to 70°C, overcomes the refractory nature of chalcopyrite, allowing relatively fast leach rates and increased copper recovery.

In addition to bio-assisted leaching, BHP Billiton has developed successful tank bioreactor leaching technologies to treat nickel and copper concentrates under the respective registered process trademarks of BioNIC™ and BioCOP™.

For more information: BHP Billiton, Carolyn Steere, Tel: +61 3 9609 3670, Carolyn.Steere@BHPBilliton.com



CSIRO'S FLECK TECHNOLOGY WILL ENABLE WIRELESS ENVIRONMENTAL MONITORING THUS REDUCING THE COST OF WATER RESOURCES MONITORING AND INCREASING WATER EFFICIENCY

Quenching our thirst for water

CSIRO is spearheading a \$9 million-a-year project to help ease Australia's current water management crisis.

A new national Water Resources Observation Network (WRON), set up by CSIRO through the Water for a Healthy Country Flagship, is aiming to improve water management, and make a 20 per cent cost saving in the process.

The heart of the problem facing Australia is a lack of accurate and timely water information.

An important part of the WRON vision is to transform Australia's disparate sources of water data into a nationally accessible and consistent water information system.

By making data more available and improving modelling, forecasting and reporting tools, WRON technologies will open the door to significantly better management, reporting and forecasting of water resources.

WRON technologies will allow water managers to better anticipate changes in water availability and demand, define adequate allocations, shape demand and inform new infrastructure planning.

For more information: CSIRO, Leane Regan, Tel: +61 2 6246 4565, www.wron.net.au

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Scientific themes

- The human mind and behaviour
- The very big and the very small
- Maintaining an open society through science
- Engineering the body
- What should we eat and how should we look like?
- Enhancing energy security, fighting global warming
- Science policy
- Science and art
- Demography in an ageing Europe
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THE CRC PROGRAMME LINKS RESEARCHERS WITH INDUSTRY TO TURN IDEAS INTO COMMERCIAL REALITY

The Cooperative Research Centres (CRC) Programme

The CRC Programme has contributed funding towards the most comprehensive pilot project in the world to commercially test the storage and monitoring of concentrated carbon dioxide deep underground in geological formations, undertaken by the CRC for Greenhouse Gas Technologies.

This project aims to cut carbon dioxide emissions to the atmosphere and develop major new business opportunities for Australian industry and is one of many CRC innovations.

The CRC Programme links researchers with industry to help turn Australia's scientific breakthroughs into successful new products and services, many of which are entering international markets. There are six broad CRC research sectors: Agriculture and Rural-based Manufacturing, Environment, Information and Communication Technology, Manufacturing Technology, Medical Science and Technology, Mining and Energy.

Key features of the Programme are the close interaction between researchers and the users of research, and the supply of industry-ready graduates from the CRC education programmes.

Since the Programme began in 1990, all parties have committed more than \$11 billion (cash and in-kind) to CRCs.

For more information: CRC Programme, Belinda Rutledge, Tel: +61 2 6240 5259, crc.program@dest.gov.au



PROFESSOR GLENN KING FROM THE INSTITUTE FOR MOLECULAR BIOSCIENCE WITH AN AUSTRALIAN TARANTULA – PHOTO COURTESY: CHRIS STACEY, THE UNIVERSITY OF QUEENSLAND

Researcher to fight insects with spider venom

An Australian researcher is working on environmentally friendly insect control methods based on spider venom compounds.

Professor Glenn King recently joined The University of Queensland's Institute for Molecular Bioscience, where he will further develop his pioneering approach to insecticide discovery.

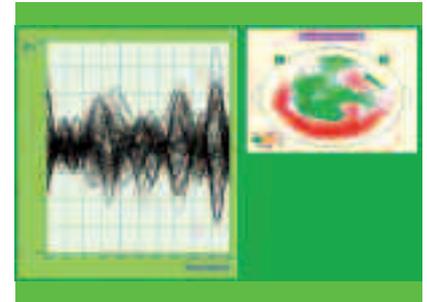
"Since spiders have been developing insecticidal compounds for almost 400 million years, I decided to interrogate their venoms to find natural toxins that might kill insects without harming vertebrates," Professor King said.

He has since described three families of insecticidal compounds, and moved to Australia with the help of a A\$576,000 Australian Research Council grant titled, 'Safeguarding Australia against invasive arthropod pests.'

"An increasingly serious public health issue is the emergence of infectious diseases spread by insects such as ticks and mosquitoes," Professor King said.

"Hopefully this project will result in environmentally-sustainable methods for controlling those insects that destroy crops or spread human and animal disease."

For more information: The University of Queensland's Institute for Molecular Bioscience, Bronwyn Allan, Tel: +61 7 3346 2134, www.imb.uq.edu.au



IMAGES OF THE BRAIN TAKEN WITH MEG. THE IMAGE ON THE LEFT SHOWS MAGNETIC WAVES RECORDED AS A RESPONSE TO AUDITORY INPUT. THE IMAGE ON THE RIGHT SHOWS THE SOURCE OF MAGNETIC ACTIVITY IN THE BRAIN 100 MS AFTER AUDITORY INPUT.

Language – nature or nurture?

Why can children learn any language – is it nature or nurture? Using the world's first magnetoencephalography (MEG) system designed to study cognitive processing in children, Macquarie University Federation Fellow Professor Stephen Crain will investigate whether or not children have innate language ability.

Crain's previous research suggests that the meaning of logical expressions could reside in human biology. Crain has used MEG with adults to study how the human brain processes certain language properties, such as the misuse of the word "any" in the sentence "everybody ate any pizza". He has found that the adult brain responds before the sentence is even finished. The next challenge is to use the child MEG system to see if young children respond in the same way.

Crain is deputy director of the Macquarie Centre for Cognitive Science, a research centre funded by the Australian Research Council with an emphasis on research in psycholinguistics, visual cognition and cognitive neuropsychiatry.

For more information: Macquarie University, Prof. Stephen Crain, Tel: + 61 2 9850 9434, stephen.crain@mq.edu.au

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BREAST IS BEST, NATURAL OR OTHERWISE

Some secrets of breast milk revealed?

Most mothers are aware that breast milk helps boost their baby's immune levels, but up to now it has been thought that it is mainly because of the mother's antibodies found in human milk.

New preliminary research suggests that complex protein/sugar structures within human breast milk may bind to harmful bacteria in a baby's gut, allowing it to then be flushed out. If this is the case, it may soon be possible to synthesise these structures and add them to cow's milk or formula so that mothers who are unable to breastfeed – due to malnourishment, for example – can ensure their babies are still well protected against disease.

Professor Nicki Packer of the Biomolecular Frontiers research group at Macquarie University believes this defence may have evolved in humans but not cows because of our different physiology – after all, cows have four stomachs and only eat grass!

For more information: Biomolecular Frontiers research group at Macquarie University, Prof. Nicki Packer, Tel: + 61 2 9850 8176, nicki.packer@mq.edu.au



NANOMETROLOGY: THE SIZE OF GEARS COMPARED AGAINST DUST MITES

Measuring the nano world

Nanotechnology is the revolution that promises wrinkle-resistant clothing, invisible sunscreens and drug delivery direct to the cellular level.

Materials behave differently at the nano-level. They may have physical and chemical properties that can render them beneficial or harmful.

For that reason, before we can work safely and reliably with these materials, we have to be able to measure accurately at this level – at a much smaller scale than we have ever had to measure before.

A state-of-the-art dynamic light-scattering instrument is being used at Australia's National Measurement Institute (NMI) to measure the size of nano-particles accurately and to calibrate reference particles for use in industry.

Using the internationally accepted measurement standards developed by NMI and other national metrology institutes, nanotechnology industries can improve control of manufacturing processes and product quality, ensure compliance with health, safety and environmental regulations, and innovate with confidence.

For more information: National Measurement Institute, Yen Heng, Tel: +61 2 8467 3771, yen.heng@measurement.gov.au



PROF. COLIN WOODROFFE IS A LEAD AUTHOR FOR THE UNITED NATIONS INTERGOVERNMENTAL PANEL FOR CLIMATE CHANGE

Coral records thousands of years of climate change

Thermometer-based climate records started in 1850, so scientists have gone "back to nature" for sources of long-term climatic information to help them better understand climate change and rising sea levels.

University of Wollongong coastal geomorphologist Professor Colin Woodroffe and his team study coral fossils from coral atolls in the Pacific Ocean to reconstruct water temperature and climatic conditions in the region over the last 4,000 years.

By studying oxygen isotopes measurements from the skeletal bands in coral fossils they find on islands like Kiritimati (Christmas) Island in the Kirabiti group, Professor Woodroffe's team has a "window" into thousands of years of climate data, with particular insight into El Niño-Southern Oscillation (ENSO) variability.

El Niño has a profound effect on the climate of Australia and the west coast of South America, and its influence extends into the Atlantic Ocean.

For more information: University of Wollongong, Prof. Colin Woodroffe, Tel: + 61 2 42215490, colin@uow.edu.au



Warm climate. Hot science. **Cool bananas.**

Queensland, Australia's Smart State, is already home to many world firsts in science and technology—and bananas—and the state is also blessed with perfect weather, beaches and natural wonders like the Great Barrier Reef and Daintree Rainforest.

Our researchers are developing life-saving bananas with a higher iron content to boost the nutrition of children in Uganda—a country with one of the highest child death rates in the world due to malnutrition. Bananas are a staple food in Uganda but the local variety is low in iron and pro-vitamin A and leaves 40 per cent of Ugandan children with anaemia.

Queensland is also home to the world's first cervical cancer vaccine and our researchers may be on the verge of supplying the world with a way to prevent prostate cancer.

The Queensland Government has already invested over US\$1 billion to position Queensland as Asia Pacific's centre of excellence for science and technology—and this has major benefits for people the world over.

Queensland—the climate's great for science and innovation.

www.innovation.qld.gov.au



AUSTRALIA'S HUNDREDS OF MILLIONS OF CATTLE, SHEEP, PIGS AND OTHER AGRICULTURAL ANIMALS RELEASE METHANE AND OTHER GASES INTO THE ATMOSPHERE

Animals contribute to greenhouse gases

Smoke-belching coal-fired power stations and factories and fossil fuel-guzzling motor vehicles may be seen as the big villains of the global climate change debate, but they aren't the only ones contributing to the greenhouse effect.

Australia's hundreds of millions of cattle, sheep, pigs and other agricultural animals – not to mention our native fauna – also release significant amounts of methane and other gases into the atmosphere.

To better understand global environmental issues such as the greenhouse effect and ozone depletion, we need to understand the sources and transformation of atmospheric gases, including those produced by animals.

The Centre for Atmospheric Chemistry at the University of Wollongong is studying the impact of agricultural animals on atmospheric gases in different climatic regions of Australia. Part of its monitoring program involves a unique partnership with the famous Ghan train, which travels between Alice Springs and Darwin and will carry an FTIR spectrometer that measures atmospheric gases as it crosses the continent.

For more information: University of Wollongong, Prof. David Griffith, Tel: +61 2 42215490, griffith@uow.edu.au



VESKI FELLOW PROFESSOR ANDREW HOLMES WITH MEMBERS OF HIS RESEARCH TEAM

VESKI's innovative fellowships deliver results

VESKI's main initiative – to return successful Australian expatriates with outstanding skills in science, technology and design – is paying off with some inspiring work.

In 2004, VESKI's – Victorian Endowment for Science, Knowledge and Innovation – inaugural Fellow Professor Andrew Holmes returned from Cambridge University to work in a new \$100 million Bio21 Molecular Biology and Biotechnology Institute. One of the most important research areas to emerge since has been the development of cheap plastic solar cells.

Professor Marcus Pandy has also relocated – from the University of Texas to the University of Melbourne – and is developing new non-invasive tools to treat joint disease such as osteoarthritis.

And Dr. Gareth Forde returned from Cambridge University to join the Monash University Department of Chemical Engineering to work on a new generation of DNA-based vaccines and streamline the time in which vaccines are produced to as little as two weeks.

For more information: VESKI, Julia Page, Tel: +61 3 9635 5700, www.veski.org.au



THROW AWAY YOUR READING GLASSES

Dynamic vision – new eyes for old

Want to throw away your reading glasses?

When we read or look at something close, the flexible lens inside our eye changes shape to provide the close focus required.

However, as we age, that lens progressively becomes harder, and its ability to change shape is reduced. Because of this, almost everyone over the age of 45 needs glasses for reading and other close work.

The Vision Cooperative Research Centre is developing a revolutionary flexible gel lens to replace the old hardened lens and restore natural vision. It acts like the natural young lens – changing shape and focus so that people can see for reading and other close activities. Implanting the gel would be a simple procedure similar to current cataract surgery. The hardened lens contents are removed, and then replaced with the gel, which begins as a liquid and is then set in place with light.

Patents on key technologies have been granted in international regions.

For more information: The Vision Cooperative Research Centre, Kylie Evans, Tel: +61 2 9385 7406, www.visioncrc.org

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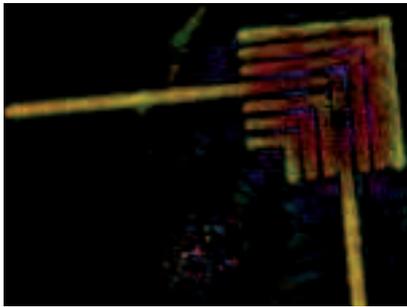
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FIRST NON-CRYSTALLINE SAMPLE EVER RECOVERED BY EMERGING TECHNIQUE OF FRESNEL COHERENT DIFFRACTIVE IMAGING

Shattering the crystal lattice

Watson and Crick's discovery of the structure of DNA is arguably the greatest of the 20th century. The significance lies in its profound influence on our understanding of the nature of life and in its striking demonstration of the power of two disciplines – physics and biology – collaborating to solve a major problem.

The method employed by Watson and Crick was crystallography, a method originating with the Australian father and son team of W.L. and W.H. Bragg, and it was the younger Bragg's laboratory in which the DNA structure was solved.

Today, crystallography of proteins remains a profoundly important technique at the heart of biotechnology. But crystallography relies on the creation of a crystal, and the most interesting molecules will not crystallise. The goal of the ARC Centre of Excellence for Coherent X-ray Science is to develop, using the most modern X-ray sources on the planet, an approach to protein crystallography that removes the need to make a crystal.

For further information: ARC Centre of Excellence for Coherent X-ray Science, Tania Smith, Tel: +61 3 8344 5444, tnsmith@ph.unimelb.edu.au



THE VENOM FROM MARINE CONE SHELLS HAS BEEN SHOWN TO PROVIDE PAIN RELIEF FOR HUMANS – PHOTO COURTESY: DAVID PAUL, ZOOLOGY

Venom from the sea cures human pain

The University of Melbourne's Departments of Biochemistry and Molecular Biology, and Pharmacology have over recent years identified cone shell venom as a potential treatment for chronic pain in humans.

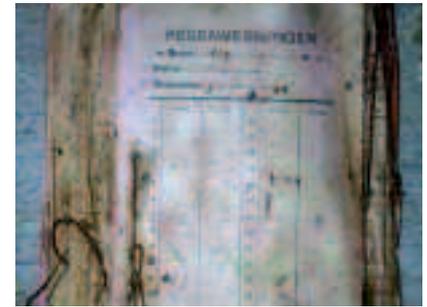
Researchers continue to develop the research into a commercialised product. One of the venom peptides identified is currently in phase two of clinical trials.

Cone snails (cone shells) inject their prey with toxic venom, which paralyses and eventually kills. Some 30 humans have died from cone snail envenomation.

The venom is a cocktail of potent peptides that each target specific nerve channels or receptors involved in vital body functions, such as muscle contraction.

Associate Professor Bruce Livett who is leading the research says the finding that cone snail analgesics are effective in humans, has opened a Pandora's Box of potential drugs from the sea for commercial development as clinical pharmaceuticals.

For further information: University of Melbourne's Departments of Biochemistry and Molecular Biology, and Pharmacology, Dr. Bruce Livett, Tel: +61 3 8344 2322/5911, Email: b.livett@unimelb.edu.au



DAMAGED COLONIAL-ERA DATA FROM SAMOA

Rescuing the South Pacific's weather data

Climate specialists from Australia's Bureau of Meteorology are helping Pacific nations save precious weather data threatened by decay, vermin attack and tropical weather.

Two years ago, experts from the Bureau's National Climate Centre visited the Solomon Islands, Kiribati, Vanuatu, Papua New Guinea and Fiji to assess the condition of paper-based climate records, advise on conservation and take immediate action where needed. Now, team members are now helping those countries and Samoa derive further benefits by training staff and installing climate data management software.

The project manager for the Pacific Islands Data Rescue Project, Rod Hutchinson, says paper records deteriorate in humid equatorial conditions if they are not stored in optimum conditions. "We were at risk of losing weather observations going back for generations – information vital to our global understanding of climate variability and climate change. Regional meteorologists also use this historical data for forecasting climate trends and extremes."

For further information: Australia's Bureau of Meteorology, Rob Morton, Tel: +61 3 9669 4188, r.morton@bom.gov.au

INNOVATING TOMORROW, **TODAY**

BHP Billiton is the world's largest diversified resources company. Our employees work in more than 100 operations in approximately 25 countries. We discover, develop and market a range of commodities including aluminium, energy coal and metallurgical coal, copper, manganese, iron ore, uranium, nickel, silver, titanium minerals, oil, gas, liquefied natural gas and diamonds, to meet the world's resource and energy needs.

Innovation is integral to our success today and in the future. Everyday our engineers and scientists develop technological solutions to drive growth across our business. We are creating systems and processes that enable us to locate new resources and unlock resources once deemed uneconomical to process. We are always striving to develop new products and maximise the technical performance of our commodities.



THE PLANT SEX CELL 'SWITCH' WAS FIRST IDENTIFIED IN LILIES

Master switch turns plant sex life on and off

University of Melbourne researchers have isolated a genetic 'switch' that can be turned on or off to alter the development of sex cells in plants.

The discovery brings understanding of fertilisation in plants to a new level, and is an important step towards growing greater amounts of food through increased fertilisation of crop plants.

Professors Mohan Singh and Prem Bhalla, who head the University's Plant Molecular Biology and Biotechnology Laboratory in the Faculty of Land and Food Resources, analysed the genetic makeup of white lilies and other flowering plants to identify a germline-restrictive silencing factor (GRSF).

The GRSF is a protein, which is present in all plants during growth and can be turned off to effectively block the development of sex cells in plants.

Plants that produce pollen-causing hay fever may be able to have their sex cell development – and therefore pollen production – turned off.

For more information: University of Melbourne, Prof. Mohan Singh, Tel: +61 3 8344 5051, mohan@unimelb.edu.au



SCIENTISTS AND STUDENTS SEEKING A SUSTAINABLE FUTURE AT A CSRP WORKSHOP

Sustaining the shrinking footprint

Industry has increased its efficiency from what it was in the past, to the point where its current ecological footprint is a fraction of what it used to be.

Now imagine an industry sector that produces zero waste, is carbon neutral and husbands the earth's resource endowment for future generations.

The Cooperative Research Centre for Sustainable Resource Processing (CSRP) is searching for technological solutions to progressively eliminate waste and emissions in the minerals cycle, while enhancing business performance and meeting community expectations.

CSRP's research program is working on things such as developing a low Greenhouse Gas (GHG) concrete from waste materials. Concrete currently contributes more than 5 percent of society's GHG emissions worldwide.

It is also looking into Biomass, a low GHG potential replacement for coal in metal production.

And it is researching energy efficient liberation and comminution (i.e. grinding of mineral ores), which uses 14 percent of Australia's electricity!

Developing these practical technologies feeds into sustainable development, which involves defining sustainability, how is it measured and how we can achieve it.

All this will contribute to a roadmap toward a healthy, profitable, carbon-constrained, resource-limited world.

For more information: Centre for Sustainable Resource Processing, Stevan Green, Tel: +61 8 6436 8702, www.csrp.com.au



CRC SCIENTISTS ARE REVEALING THE TRUE POTENTIAL OF SUGAR CANE

Turning sugarcane into a clean green energy source

Sugarcane is one of nature's most efficient natural converters of sunlight, carbon dioxide and water into fuel or biomass – and as such, it is perhaps the world's fastest growing and largest biomass agricultural crop.

The Australian-based Cooperative Research Centre for Sugar Industry Innovation through Biotechnology (CRC SIIB) is investing in world-class research into sugarcane as a plant-based biofactory.

Essentially, the CRC SIIB is taking a three-pronged approach to biofactory research including engineering sugarcane to make bioplastics; researching biorefinery opportunities from the sugars already produced by sugarcane; and using biomass for natural products and a cheap source of sugars and lignin, a complex polymer that with cellulose, forms the chief part of woody tissue.

For more information: Cooperative Research Centre for Sugar Industry Innovation through Biotechnology, Julie Lloyd, Tel: +61 7 3331 3309, www.crcsugar.com

We were taught in school that the speed of light is constant, but did you know it could be slowed down?

Using a principle first observed in the first half of the 19th Century, researchers from CUDOS have managed to slow a pulse of light without distorting its shape. In 1834 a self-reinforcing single wave (soliton) was formed in a Scottish canal. Due to the shape of the canal walls, a water wave was observed travelling miles without breaking up. Using the same principle, special glass, and a carefully designed crystal lattice, CUDOS researchers were able to slow a light soliton without corruption.

Light travels extremely fast – it can travel around the world in about a tenth of a second. Signals travelling along optical fibres have enabled high speed data transfer over huge distances, but information throughput is limited by electronic devices

at each end of the fibre where light signals are changed into electronic data to be stored, redirected and amplified at each junction. The aim of a photonic chip is to replace these electronic components with photonic ones. Slow Light is just one of CUDOS' research projects advancing the practical application of light in technology. By slowing light, we can buffer or store pulses of light. Other CUDOS projects focus on signal regeneration and switching components using optics, both required of a Photonic Chip.

World-wide implementation of Photonic Chips would speed up the internet. Used in individual computers, optics could replace wires to interconnect electronic chips. The potential uses don't stop at computing and communications. This kind of control of

light could have innumerable applications; particularly wherever there is a requirement for the ultra-small and ultra-fast - such as within biomedical chips.

CUDOS is an Australian Research Council Centre of Excellence whose aim is to enhance Australia's communications structure and our status as a technologically advanced economy. For further information please visit www.cudos.org.au or phone Ben Eggleton, Research Director on 0413 385 715.



Schematic of a photonic chip or all-optical processor

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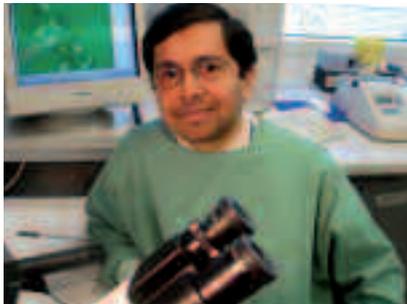
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DR. PAUL VERMA AND HIS STEM CELL RESEARCH

Dairy stem cells a world first

Embryonic stem cells from cattle can now be stored in mass in the laboratory, paving the way for advanced breeding developments in dairy cattle and other livestock.

These new ways of efficiently isolating and maintaining cells provide scientists from Australia's Dairy Cooperative Research Centre with the raw materials to investigate a range of stem cell applications.

The developments have been made by Dr. Paul Verma and his team, at the Monash Institute for Medical Research, Monash University as part of the Dairy CRC's Breeding Technologies Program.

Internationally, this is the most advanced stem cell work in a domestic species. It is core research which adds significantly to knowledge about cell development and breeding.

The project is funded by the Dairy CRC which aims to enhance the profitability of the Australian dairy industry through development and application of new genetic technologies.

What is a stem cell? Stem cells are cells that have not yet become a specific type of cell such as heart, brain or liver cell. Embryonic stem cells can potentially produce every type of cell found in the body (eg skin, mammary gland or sperm cells).

*For more information: Dairy CRC,
Gabrielle Sheehan, Tel: +61 3 9607 8608,
gabrielle.sheehan@dairycrc.com*



RAIL CRC IS NOW RELEASING RESULTS FROM MORE THAN 45 SIX-YEAR RESEARCH PROJECTS

Rail science fast-tracked by Rail CRC

Rail CRC is releasing research outcomes from more than 45 research projects that span six universities and six years.

It is the first time this research has been publicly showcased, with many projects only just completed.

The Rail CRC Technology Showcase to be held in Brisbane, Australia in June 2007, will cover world-scale scientific and technological innovation such as a wood treatment technique that effectively transforms plantation softwood into material paralleling the old-growth forest hardwood required for railway sleepers.

The CRC has developed "heath card" technology that looks like a small box attached to trains or rollingstock wagons, and reports future maintenance problems that can be fixed before they happen.

Attached to this is also the option to include an instant braking technology which applies all brakes simultaneously – allowing heavier, faster trains to operate just as safely.

Research outcomes offer fuel savings, stronger rail bridges and steel, faster tracking capabilities, electronic modelling tools, instant rail schedules, higher safety levels, greater efficiencies, and advanced environmental safeguards.

*For more information: Rail CRC,
Patricia Stevenson, Tel: +61 3 7 4930 9064,
p.stevenson@cqu.edu.au*



2007 L'ORÉAL-UNESCO AWARDS LAUREATES:
PR. TATIANA BIRSHTEIN (RUSSIA); PR. MILDRED DRESSELHAUS (USA); PR. AMEENAH GURIB-FAKIMI (MAURITIUS); PR. LIGIA GARALLO (CHILE); PR. MARGARET BRIMBLE (NZ) – PHOTO COURTESY: SA©VERINE VASSELIN/GAMMA

The world needs science – science needs women

Since 1998, a public-private partnership between L'Oréal and UNESCO has promoted women in science. The L'Oréal-UNESCO Awards For Women in Science recognises outstanding women researchers who have contributed to scientific progress.

These scientists are role models for the next generation, encouraging young women around the world to follow in their footsteps.

Firstly the international scientific community proposes candidates. Next two juries – one in the Life Sciences and the other in the Material Sciences – meet every alternate year to select laureates from these fields.

The UNESCO-L'Oréal International Fellowships offer 15 promising young women scientists crucial international experience that they can bring back and share with others in their home countries.

The partnership also provides L'Oréal National Fellowships with support from UNESCO national commissions. National Fellowship programs exist in 20 countries, respecting the countries specific science needs. L'Oréal Australia is launching its National Fellowships at the WCSJ; Fellows will be announced in September 2007.

Pr. Christian De Duve, Nobel Prize in Medicine 1974 is the founding president of the awards.

*For more information: L'Oreal Australia,
Megan Ryan, Tel: +61 3 9928 3339,
www.forwomeninscience.com*

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VESKI (Victorian Endowment for Science, Knowledge and Innovation) offers a dynamic program of fellowships, awards and international networks in the fields of science, design and technology.

VESKI enhances Victoria's intellectual capital by assisting innovative Australian expatriates and leading researchers to undertake their work in Victoria.

Melbourne is one of the world's most liveable cities. It offers a strong work life balance in a creative, harmonious and culturally diverse community.

Victoria is Australia's leading centre for innovation, scientific research and development, and design.

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Predicting Australia's mineral future

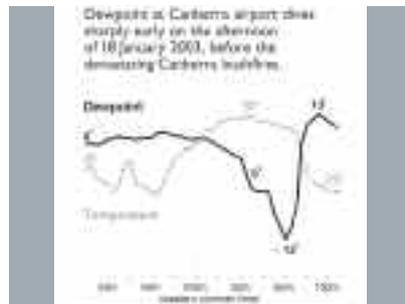
Predictive mineral exploration by Australian scientists has given local mining companies a powerful edge in the hotly competitive world gold market. Instead of pouring money – and lots of it – into the ground in the quest for undiscovered mineral deposits: often coming up empty.

Ore deposit modelling helps to predict where rich deposits are most likely to occur. It's the result of a partnership formed in 2001 between the mining industry and the research community to examine the critical issues surrounding mineral exploration in Australia.

The partnership or cooperative research centre, pmd*CRc, has developed a vastly improved understanding of mineralising processes and a four-dimensional understanding of the evolution of the geology of mineralised terrains.

The success of pmd*CRc's innovative programs and the level of expertise of research teams, has placed the CRc in a strong position to respond to opportunities for commercialisation of technology-based intellectual property.

*For more information: pmd*CRc, School of Earth Sciences, University of Melbourne, Bob Haydon, Tel: +61 3 8344 8351, www.pmdcrc.com.au*



DEWPOINT AT CANBERRA AIRPORT DIVES SHARPLY EARLY ON THE AFTERNOON OF 18 JANUARY 2003, BEFORE THE DEVASTATING CANBERRA BUSHFIRES

A satellite clue to extreme bushfire threat

The extreme weather conditions that can turn an already dangerous bushfire into an explosive firestorm can now be better predicted, thanks to the work of a 30-year veteran of the Bureau of Meteorology.

Researcher Dr. Graham Mills has found that weather satellite images provide an early warning of high-altitude, super-dry air that, if it descends to the ground, may contribute to radically increasing fire activity. Graham's theory is that turbulence in the lower atmosphere taps into the dry air, four to five kilometres above-ground and brings it to earth, rapidly reducing the humidity and further drying the fuel load.

Dr. Mills said that pinpointing bands of super-dry air on satellite images, and identifying areas of strong atmospheric mixing through the use of computer models, could provide hours of notice of potentially severe fire risk.

For further information: Australia's Bureau of Meteorology, Rob Morton, Tel: +61 3 9669 4188, r.morton@bom.gov.au



WARMER TEMPERATURES INCREASE THE THREAT OF ALIEN SPECIES, CARRIED BY HUMANS, COLONISING ICE-FREE AREAS OF ANTARCTICA

Antarctica under threat

Climate change will impose a complex web of threats and interactions on the plants and animals living in the ice-free areas of Antarctica.

Increased temperatures may promote growth and reproduction, but may also contribute to drought and associated effects. These scenarios are explored in a new book, *Trends in Antarctic Terrestrial and Limnetic Ecosystems: Antarctica as a Global Indicator*, co-edited by Australian Antarctic Division biologist, Dr. Dana Bergstrom.

The book concludes that Antarctica is not specifically different from other continents, just extremely isolated and at the end of the spectrum of planetary conditions. But among future scenarios is invasion by more competitive alien species, carried there by humans seeking a place of unspoiled wilderness or chasing scientific knowledge.

Antarctica is one of the only places on Earth where natural biological phenomena can be studied in their pristine state, but human visitation risks breaking its isolation, and seriously threatens Antarctica's unique legacy.

For more information: Australian Antarctic Division and Antarctic Climate and Ecosystems Cooperative Research Centre, Dana Bergstrom, Tel: +61 3 6232 3442, Dana.Bergstrom@aad.gov.au

OUR VISION ... A HEALTHY FUTURE

Australians today can expect to live eight years longer thanks to the health and medical research carried out over 40 years from 1960-99. A gain in life expectancy valued at A\$5.4 trillion. ⁽¹⁾

Our researchers are up there with the best in the world. Some Australian research highlights include:

- the discovery of lithium to treat bipolar disorder saving millions of lives and more than A\$5.4 billion in hospitalisation costs around the world;
- a cervical cancer vaccine which will save the lives of up to 190,000 women annually and A\$500 million each year in direct health care costs;
- antibiotics to treat stomach ulcers saving A\$250 million annually in Australia alone.

The benefits of health and medical research are unequivocal.

Research Australia's vision is a world where government, industry, philanthropy and the research sector all work together to deliver an effective and efficient health system. A community that understands and values the benefits of health and medical research is an empowered community that is able to cope with the health challenges of the future.

The media has a vital role in educating the community about health and medical research. Through excellence in journalism, you can help us make our vision a reality.

Research Australia is an alliance of more than 190 organisations committed to health and medical research. We aim to promote awareness of all biomedical research - from bench to bedside to health policy.

For more information on Research Australia visit www.researchaustralia.org or call 02 8298 8635.

(1) Exceptional Returns. The Value of Investing in Health R&D in Australia. Access Economics, 2003.



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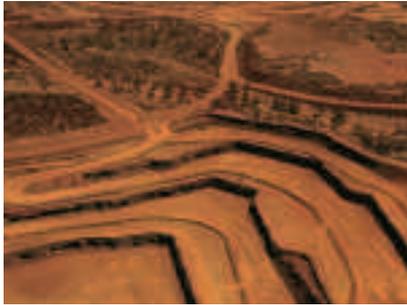
Contact Rail CRC:

(61) 7 4930 9064

www.railcrc.com.au

railcrc@cqu.edu.au

* Rail CRC Technology Showcase 2007 – June 7-8 Brisbane, Australia



BHP BILLITON'S YANDI JOINT VENTURE OPERATION IN AUSTRALIA'S PILBARA WHERE THE BLASOR™ SOFTWARE WAS FIRST USED

BHP Billiton leading the way in mine optimisation tools

The strategic planning of open pit mining projects that span several decades is critical to achieving maximum project value.

To address this issue, BHP Billiton Global Technology has developed a mine planning optimisation software tool called Blasor™. By using optimal mine planning software, strategic planners can now determine ultimate pit sizes and pit development plans that deliver maximum value over the life of the mine.

Apart from their straightforward safety and logistical advantage, mine plans allow optimal use of the in-ground resource in the downstream process plants, resulting in higher recoveries and less process plant waste for disposal. Optimal mine planning practices also improves environmental and community outcomes.

Improvements are achieved not by spending more money, but by using mathematics (optimisation) to operate existing infrastructure more smoothly and efficiently. The mathematics has been encoded into software and is used at mine sites around the world.

For more information: BHP Billiton, Carolyn Steere, Tel: +61 3 9609 3670, Carolyn.Steere@BHPBilliton.com



CSIRO ENGINEER DR. RICHARD HELMER: "THE TECHNOLOGY TAKES CLOTHING BEYOND ITS TRADITIONAL ROLE"

Every would-be rocker's fantasy comes true

CSIRO has 'built' a shirt that could fulfil the fantasy of anyone who has, in the privacy of their homes, jammed along with one of rock 'n roll's great lead guitarists.

A team led by CSIRO engineer Dr. Richard Helmer has created a 'wearable instrument shirt' (WIS) which enables users to play an 'air guitar' simply by moving one arm to pick chords and the other to strum the imaginary instrument's strings.

The WIS works by recognising and interpreting arm movements and relaying this wirelessly to a computer for audio generation. Textile motion sensors, worn on the elbows, detect motion when the arm bends.

"The technology takes clothing beyond its traditional role of protection and fashion into the realms of digital content where a wide range of new applications are appearing," Dr. Helmer says.

For more information: CSIRO, Heather Forward, Tel: +61 3 5246 4085, www.csiro.au



RED LASER LIGHT IS USED TO ILLUMINATE MICROSTRUCTURES WRITTEN INSIDE BULK GLASS USING AN ULTRA FAST LASER WRITING TECHNIQUE

Making light work of photonic chip fabrication

Macquarie University laser physicists are part of a consortium developing a micro-processing platform that will revolutionise photonic chip fabrication. This technology has implications for a diverse range of applications such as fibre-to-the-home (FTTH), smart sensor arrays for aircraft, biosensing and astronomy.

The next generation photonic components being developed by the Centre for Ultrahigh-bandwidth Devices for Optical Systems, which involves five universities – Macquarie, Sydney, Swinburne, ANU and UTS – will help facilitate FTTH.

FTTH delivers the broadband telecommunications capability of optic fibre networks directly into the home. It enables access to the much-hyped 'Triple Play' technology – the transmission of voice, Internet content and video on demand. FTTH is currently experiencing rapid growth, with 7 million new subscribers each year (3 million in Japan alone) and estimates ranging from 30 to 60 million total subscribers by 2010.

For more information: Macquarie University, Assoc. Prof. Mick Withford, Tel: + 61 2 9850 7056, michael.withford@mq.edu.au



UNIVERSITY OF WOLLONGONG GEOCHRONOLOGIST PROF. RICHARD ROBERTS WITH COLLEAGUES DR. KIRA WESTAWAY AND DR. CHRIS TURNEY (LEFT TO RIGHT)

Dating the hobbit

When Australian and Indonesian scientists revealed their "Hobbit" discovery in 2004, it created a sensation. *Homo floresiensis* was a previously undiscovered branch of the human family tree, raising images of a lost world of "little people" living on a remote island in eastern Indonesia.

What really excited scientists about the discovery of the one-metre tall adult skeleton in a cave on Flores was the realisation this species had co-existed with *Homo sapiens* until just 12,000 years ago.

University of Wollongong (UOW) geochronologist Professor Richard 'Bert' Roberts with colleagues Dr. Chris Turney and Dr. Kira Westaway used a variety of techniques, including radiocarbon, thermoluminescence, uranium-series and electron spin resonance, to date the "Hobbits".

UOW has world-class dating facilities at the GeoQuEST Research Centre. Its experts work with UOW's "Hobbit" discoverer Professor Mike Morwood and other scientists around the world gathering important information on topics ranging from human evolution to climate change.

For more information: University of Wollongong, Prof. Richard Roberts, Tel: +61 2 42215490, rgrob@uow.edu.au



BUSHFIRES ARE INCREASING IN FREQUENCY AND FEROCITY

Fighting fire with science

In Australia we call them bushfires. In other parts of the world they are called forest fires, and global climate change and increasing human populations mean they are increasing in frequency and ferocity.

Wherever they occur – from the Australian bush to the Amazon Basin, the jungles of Sumatra or the hills around Los Angeles – fires can have a devastating impact on the environment, on biodiversity and, in many cases, on property and human life.

The Centre for Environmental Risk Management of Bushfires at the University of Wollongong is dedicated to scientific analysis of bushfire risks, and to resolving perceived conflicts between protection of human life and property, biodiversity conservation and protection of other environmental values.

The Centre is led by Professor Ross Bradstock, who has an international reputation for his work in fire management research, while the University's Dean of Science Professor Rob Whelan is one of Australia's leading authorities on the ecological effects of bushfires.

For more information: University of Wollongong, Prof. Ross Bradstock, Tel: +61 2 4221 5531, rossb@uow.edu.au



THE HONOURABLE JOHN BRUMBY MP – MINISTER FOR INNOVATION ANNOUNCING THE RECIPIENTS OF THE 2006 VESKI INNOVATION FELLOWSHIPS

Women at scientific forefront awarded new VESKI Innovation Fellowships

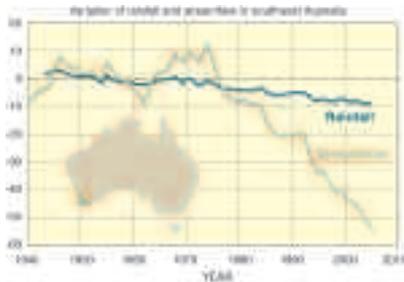
VESKI – Victorian Endowment for Science, Knowledge and Innovation – has awarded its latest Innovative Fellowships to two outstanding woman scientists.

VESKI was established with a \$10 million endowment from the Victorian Government to entice talented expatriates home.

After seven years in the U.K. (Edinburgh, Cambridge and Oxford Universities), VESKI Fellow Dr. Cait MacPhee, will return home to Victoria to continue her ground-breaking research into the development of new materials by mimicking the way nature's proteins self-assemble and heal.

As well VESKI Fellow Dr. Alyssa Barry has returned from New York to join a team in the International Health Research Unit at the Burnet Institute where she is continuing her research into the study of genes relating to the malaria parasite in the hope of developing a vaccine against the infection.

For more information: VESKI, Julia Page, Tel: +61 3 9635 5700, www.veski.org.au



VARIATION OF RAINFALL AND STREAM FLOW IN SOUTHWEST AUSTRALIA

Unlocking secrets of significant declines in regional rainfall in Australia

Bureau of Meteorology Research Centre climate scientists believe they have part of the answer to significant declines in Australian regional rainfall and subsequent stream flow since the 1970s.

Dramatic rainfall declines in early winter in southwest Western Australia became evident from the 1970s. Similar declines were observed in southwest Victoria and southern South Australia from the mid-1990s.

Researchers were puzzled why the impacts were felt two decades earlier in the west.

Their latest analyses suggest the changes were driven by an increase in mean sea-level pressure that first weakened rainfall from a long-lasting trough located in winter off the WA's south west coast. The impact was slower to reach the affected parts in the southeast, which are influenced by a persistent high-pressure ridge.

The impacts are consistent with observed changes of the Southern Annular Mode (variations in the upper level circumpolar westerly jet streams), which affect surface pressure in particular. The researchers are now investigating whether the known human influences on the Mode are a plausible cause for the rainfall declines.

For further information: Australia's Bureau of Meteorology, Rob Morton, Tel: +61 3 9669 4188, r.morton@bom.gov.au



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CRC PROGRAM

- Established in 1990 to enhance collaboration in R & D
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BENEFITS

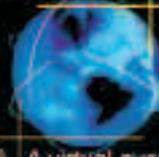
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For more information visit the CRC Association's web site
<http://www.crca.asn.au>

www.science.unsw.edu.au/worldwide

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