



DISCOVERY

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A MESSAGE FROM THE MINISTER



■ It gives me great pleasure to again be able to write this message for *Discovery*. I am pleased that my continued appointment as Minister for Innovation, Industry, Science and Research means I can continue to foster and advance research in Australia.

The Australian Research Council (ARC) is an organisation well placed to support the Australian Government's innovation agenda outlined in *Innovation to move Australia forward* (released in August 2010), and the ARC is a key player in the Australian Government's *Powering Ideas: An Innovation Agenda for the 21st Century* (released in May 2009).

The ARC has achieved a great deal in recent years, supporting and advancing research and innovation in Australia, including:

- restoring integrity and independence to the research system through the ARC Advisory Council;
- expanding Australia's research fellowships to attract and retain the world's best researchers, most recently through the *Australian Laureate Fellowships* scheme and the *Super Science Fellowships* scheme; and

- introducing the Excellence in Research for Australia initiative to measure the quality of research undertaken in Australian universities.

There are also challenges ahead that the ARC will play an important role in addressing, including climate change, industry collaboration and building Australia's research capacity.

The ARC is helping to increase Australia's research base and capacity in climate change science through the funding of high-quality research and researchers. In July I awarded Australian Laureate Fellowships to international research leaders in areas important to climate change science.

This included Professor Matthew England who will use his fellowship to further his oceanography and climate model research, Professor William Laurance who will use his fellowship to further his research into tropical rainforest ecology and Professor Chris Turney who will use his fellowship to research current and past climate records.

In addition, in 2011, the ARC Centre of Excellence for Climate System Science will be established to address uncertainties in regional climate science.

Continued on page 2...

CEO'S COLUMN



■ Welcome to our bumper Spring edition of *Discovery*.

This is the largest edition of *Discovery* that we have produced, which is testament to the fantastic research being undertaken by Australian universities and their researchers, supported by the Australian Research Council (ARC).

This edition covers a number of research disciplines and highlights

some of the incredible work being undertaken in ARC Centres of Excellence and through the *Linkage* and *Discovery Projects* schemes. It also highlights the research achievements of women in science. In this edition we feature a story on the ARC's 13 new Centres of Excellence that will receive funding from 2011. There are three female Directors in the 2011 cohort of successful centres. One of these Directors is Professor Philippa Maddern, an internationally renowned researcher in humanities and social sciences—Professor Maddern will come to be regarded as a

Photograph by Norman Plant.

A MESSAGE FROM THE MINISTER CONTINUED

Continued from page 1...

Innovation to move Australia forward identifies the need to increase collaboration between public researchers and private industry. The ARC *Linkage Projects* scheme specifically supports these collaborations, encouraging innovative and user-driven research.

The new industrial PhDs that will be awarded under the ARC *Linkage Research Training Awards* scheme to further enhance collaboration between industry and academic researchers. As part of the Government's Clean 21 Initiative, the scheme will target a range of industry sectors, with priority given to green industries and new strategies to enable the greening of existing industries.

Supporting world-class researchers and research training is vital to ensure Australia's future research capacity. Through the Research Workforce Strategy, the Government is addressing the expected shortfalls in the supply of research qualified people in Australia and also concerns about the lack of clear career paths for research students.

Through the three main fellowship schemes—*Australian Laureate Fellowships*, *Future Fellowships* and *Super Science Fellowships*—the ARC is targeting and supporting researchers at all stages of their careers. In addition, the ARC is currently reviewing its suite of fellowships to further support research

The ARC is helping to increase Australia's research base and capacity in climate change science through the funding of high-quality research and researchers.

career paths and ensure our next generation of researchers can build on the great research that is being undertaken today.

Science Engagement is another important aspect of the work ahead for the Australian Government, and the ARC has a number of initiatives aimed at increasing Australia's science engagement, such as sponsorship of annual initiatives like the Australian Museum Eureka Prizes, Science Meets Parliament and National Science Week.

An event I am again looking forward to is the Major Grants Announcement research expo where the ARC involves members of the general community, in particular primary and secondary school students. This involvement not only raises awareness of science and research, it engages a new generation and

excites the young about the prospect of careers in science.

So, as I embark on another term as Minister responsible for research, I know that the ARC is well placed to help the Government achieve its innovation agenda.



Senator Kim Carr
Minister for Innovation,
Industry, Science and Research

CEO'S COLUMN CONTINUED

Continued from page 1...

pioneer for leading this type of humanities centre, and it is pleasing to see the humanities represented in this cohort of Centres of Excellence.

While on the subject of women doing great things in research, it is important to note that four out of the 15 Australian Laureate Fellowships announced in July—and featured in this edition of *Discovery*—were female. This is the largest cohort of women ever recognised in a round of ARC fellowships at this level.

The good news continues for women in science with ARC Federation Fellow, Professor Tanya Monro, recently being named the joint winner of the 2010 South Australian Scientist

of the Year. This is well-deserved recognition for Professor Monro personally, but also for women in science generally.

The enormous scope of the ARC continues to make an impact on research in this country and I hope you will be as proud as I am to read about some of the great achievements that are detailed in this edition of *Discovery*.



Professor Margaret Sheil

...the ARC Centre of Excellence for Climate System Science will be established to address uncertainties in regional climate science.

— Senator the Hon. Kim Carr

NEW SCHEME

Linkage Research Training Awards

New ARC scheme enhances collaboration

■ A new initiative to further enhance collaboration between industry and academic researchers will soon be delivered by the Australian Research Council (ARC).

The Australian Government's *Linkage Research Training Awards* scheme will focus on increasing industry engagement in research and development projects in industry sectors vital to Australia's future.

The new awards are part of the Government's Clean 21 initiative which will focus on emerging green industries and reducing the environmental impact of existing industries. The Clean 21 initiative is one of the priorities in the Government's *Powering Ideas: an innovation agenda for the 21st century*.

The scheme will give postgraduates valuable hands-on experience undertaking end-user-focused research in industries that are vital to Australia's green future, and will encourage industry to participate in research training and later employing people with doctoral qualifications.

The \$24.3 million scheme will provide for up to 100 awards in 2012 and up to 100 awards in 2014. Awards will be provided to eligible institutions with research activity in key areas.

Industry partners and students can be identified after award of ARC funding. This will simplify negotiations between institutions and industry and enable the industry partner to have certainty that the project will proceed before committing the additional cash and in-kind support required to conduct the project.

It is anticipated that the first round of the scheme will open for applications in May 2011.

The ARC is currently developing the Funding Rules for the ARC *Linkage Research Training Awards*.

More information about this scheme will be made available on the ARC website over the coming months at www.arc.gov.au

The \$24.3 million scheme will provide for up to 100 awards in 2012 and up to 100 awards in 2014.



Australian Government
Australian Research Council

invites you to the

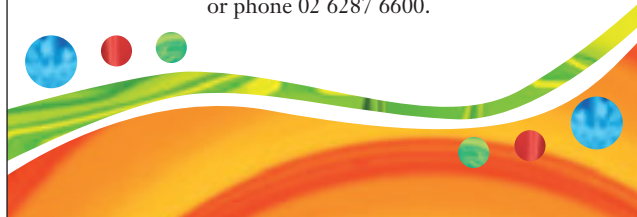
2010 RESEARCH EXPO

Monday, 25 October 2010 | 2 pm to 4 pm

National Ballroom, Hotel Realm, Canberra

Talk to researchers, get hands on with exhibits and learn about the publicly funded research being undertaken in Australia.

For more information
Email communications@arc.gov.au
or phone 02 6287 6600.



RESEARCH in the national interest - enabling the future

RESEARCH in the national interest - enabling the future

ARC Federation Fellow named SA Scientist of the Year

■ Professor Tanya Monro, an Australian Research Council (ARC) Federation Fellow and Director of the Institute for Photonics and Advanced Sensing (IPAS) at the University of Adelaide, has been announced joint winner of the 2010 South Australian (SA) Scientist of the Year.

The announcement was made at the South Australian Science Excellence Awards on 13 August 2010.

The judging panel was unable to separate the work of two of the state's leading scientists, Professor Monro and Professor Angel Lopez (Centre for Cancer Biology, South Australia Pathology), and announced them as joint winners for their outstanding contributions in their fields.

"Being named SA Scientist of the Year serves as recognition of the excellence of the research in the area of photonics and optical fibres within IPAS at the University of Adelaide," Professor Monro said.

"It's a great way of recognising the efforts of the fabulous team around me—a team that is making real breakthroughs ranging from new insight into how light interacts with materials on the nanoscale, right through to the development of new disruptive sensing technologies for applications in health, the environment, agriculture and defence.

"Winning this award boosts my confidence in pursuing a transdisciplinary approach to my science, bringing together optical physics, surface and synthetic chemistry and key areas of biology.

"I strongly believe that our opportunities to do great science are particularly strong at the boundaries between the scientific disciplines, and that we need to find ways to drive forward such research.

"It also boosts the visibility of our work, and I hope this will help us not only to continue to develop our research capacity and infrastructure, but also to start to commercialise some of our emerging sensing technologies," she said.

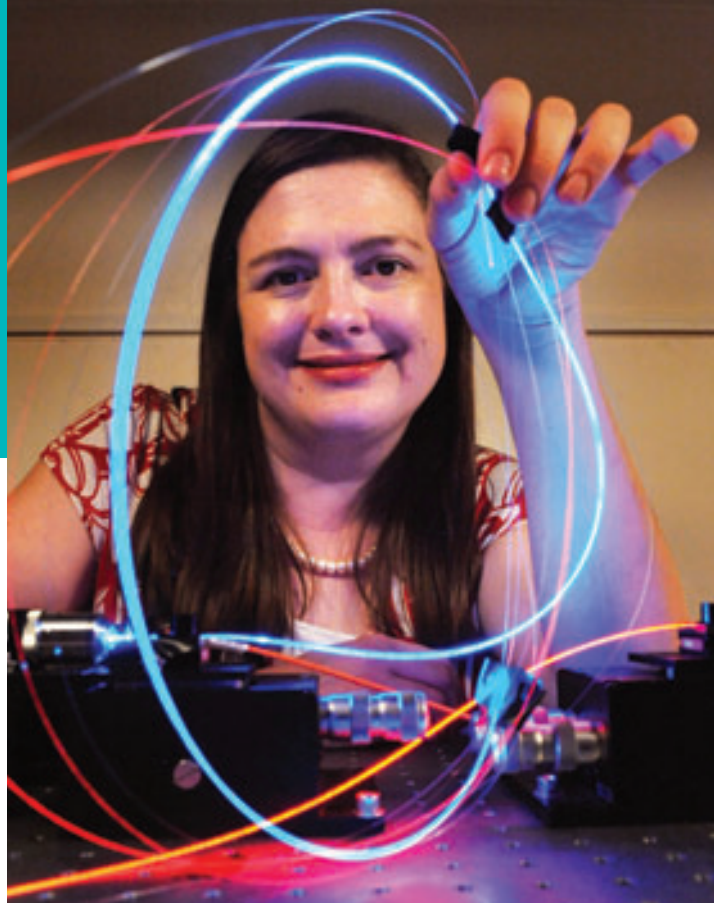
Professor Monro thanked the ARC for its generous support of her research along with her other major funders the Defence Science and Technology Organisation, the University of Adelaide and the SA State Government.

ARC Chief Executive Officer, Professor Margaret Sheil, congratulated Professor Monro on the award.

"It is further proof that Australian scientists are doing great research work that is having an impact and is being noticed."

The award adds to a long list of achievements for Professor Monro, including:

- Bragg Gold Medal for the best physics PhD in Australia (1998)
- Royal Society University Research Fellowship (2000), Optoelectronics Research Centre, University of Southampton



Professor Monro with some of the novel optical fibres made at The University of Adelaide. Photo courtesy *The Advertiser*.

- Bright Spark award, Australia's Top 10 Scientific Minds under 45 (2006)
- Prime Minister's Science Prize for Physical Scientist of the Year (2008)
- *Weekend Australian* Magazine's Top Emerging Leader in Science (2009).

Professor Monro also has a long history with the ARC. She has been a chief investigator or fellow on 12 successful ARC projects since 2005 totalling \$7.4 million. Professor Monro was the first named Investigator (or project leader) on nine of the 12 projects from a wide spread of ARC schemes including *Linkage Infrastructure, Equipment and Facilities, Discovery Projects, Linkage Projects, Super Science Fellowships, and Federation Fellowships*.

The South Australian Science Excellence Awards recognise and reward excellence in science and acknowledge commitment and skill in raising public awareness of science.

The South Australian Scientist of the Year is awarded to an individual for an outstanding achievement or series of related achievements in any area of science¹ that significantly advances knowledge and has produced an outcome of benefit to the community, and for outstanding contribution to science in a leadership role, inspiring others to be involved in science.

For more information about Professor Monro visit www.adelaide.edu.au. For more information about the South Australian Science Excellence Awards visit www.scienceawards.sa.gov.au or email scienceawards@saugov.sa.gov.au.

¹ In this instance, science encompasses the physical, chemical, biological, technological and social sciences, mathematics and engineering www.innovation.sa.gov.au

EUREKA PRIZES

The winner is... Meat Standards Australia Pathways Team



Meat Standards Australia team members, Dr Paul Greenwood, Dr Drewe Ferguson and Dr Garry Griffith, with the Chief Executive Officer of the Australian Research Council, Professor Margaret Sheil. Photo Courtesy the Australian Museum Eureka Prizes and 247 Studios.

■ A simple but unique system that grades beef and tells consumers how particular cuts of meat are best cooked has earned its creators a prestigious research award.

On 17 August 2010, the Australian Research Council (ARC) *Eureka Prize for Excellence in Research by an Interdisciplinary Team* was awarded to the Meat Standards Australia (MSA) Pathways Team for its world-first collaboration designing a comprehensive paddock-to-plate meat grading system that considers what people really want to eat.

The system factors in tenderness, aesthetics, food safety and the origin of beef. It has contributed to Australia's status as one of the few countries in the world where meat consumption is no longer falling, and due to this has generated interest from the United States, the European Union and South Korea.

The MSA system was first introduced in the beef cattle industry in 1999, generating an estimated \$244 million for the Australian economy in seven years. The MSA Pathways Team continues to refine the model more than a decade after its introduction, and is now working to determine and incorporate DNA markers for meat tenderness.

The team behind the system comprises:

- Rod Polkinghorne, beef industry leader
- John Thompson, Professor of Meat Science, University of New England (UNE)
- Dr Ray Watson, The University of Melbourne
- Dr Garry Griffith, Industry & Investment NSW, UNE Beef Industry Centre
- Dr Paul Greenwood, Industry & Investment NSW, UNE Beef Industry Centre
- Dr Robyn Warner, Victorian Department of Primary Industries
- Dr Drewe Ferguson, CSIRO's Livestock Industries
- Dr David Pethick, Professor of Biochemistry and Nutrition, Murdoch University.

The \$10 000 Prize was presented by ARC Chief Executive Officer, Professor Margaret Sheil, at the Australian Museum Eureka Prizes Award Dinner.

The *Eureka Prize for Excellence in Research by an Interdisciplinary Team* encourages outstanding, innovative research that demonstrates the benefits of practical interdisciplinary cooperation.

It is awarded to an Australian research partnership, group or team for a groundbreaking research outcome that has involved collaboration and integration between researchers from two or more unrelated disciplines.

This is the 21st year of the Eureka Prizes. The ARC sponsored the inaugural Interdisciplinary Team prize in 2009; this was awarded to the Investment Framework for Environmental Resources group.

Professor Sheil said the ARC was pleased to sponsor the award again this year.

The team's work displays the qualities and collaboration that are encouraged by the *Eureka Prize for Excellence in Research by an Interdisciplinary Team*.

Presented annually, the Eureka Prizes reward excellence in the fields of research and innovation, science leadership, school science and science journalism and communication.



For more information about the MSA Pathways Team and the 2010 Australian Museum Eureka Prizes, visit www.eureka.australianmuseum.net.au

The Eureka Prize...encourages outstanding, innovative research that demonstrates the benefits of practical interdisciplinary cooperation.

Australian Laureate Fellowships



Professor Hilary Charlesworth speaking at the awards ceremony. Photo courtesy Romy Photographics.

■ **Imagine storing your entire DVD library on one disc. Imagine having safer streets to walk along at night due to reduced crime rates.**

Soon, you won't need to imagine. Thanks to the ARC *Australian Laureate Fellowships* scheme, 15 world-class research leaders will soon begin research projects aimed at providing a wealth of benefits for Australians.

Professor Min Gu of Swinburne University of Technology will use his fellowship to progress ground-breaking petabyte data storage technology, which will allow you to store the equivalent of 10 000 DVDs on one disc. This means that soon you will be able to throw away your bulky DVD cabinet and clean up the scattered DVDs that rest on your TV unit.

Professor Lorraine Mazerolle of the University of Queensland will use her fellowship to test the effectiveness of Third Party Policing—a promising new approach that involves police partnering with communities and organisations to better control crime. By using scientific experimental evidence to guide crime control policies, the outcomes of this project may make the streets safer for all Australians.

The other 13 talented research leaders will tackle issues such as climate change, human rights, gender justice; and increase our understanding of biological evolution, the way in which we learn, and the viability of technologies that could be used in the Square Kilometre Array—the world's most powerful radio-telescope.

The *Australian Laureate Fellowships* scheme provides funding for outstanding researchers from Australia and around the world.

The cohort of fellows mentioned above was announced on 6 July 2010, and presented pins at an Award Ceremony in Cairns on 7 July 2010.

“Consistent with their high international standing, the 15 Australian Laureate Fellows will collaborate with research partners from 28 countries. This will not only make for better research outcomes; it will extend Australia's international research connections, which are vital for our performance in the increasingly integrated global research system,” Minister for Innovation, Industry, Science and Research, Senator Carr said when announcing the fellows.

In addition to utilising global knowledge, each Australian Laureate Fellow will play an important role in increasing Australia's research capacity. As part of their fellowship, they will receive funding that enables them to lead and mentor a team of postdoctoral and postgraduate researchers, building Australia's next generation of research leaders.

At the Award Ceremony, ARC Chief Executive Officer, Professor Margaret Sheil, said one of the significant components of the 2010 Australian Laureates Fellowships cohort was the percentage of female researchers awarded.

“Four out of the 15 fellows are female. This is double the number of women awarded Fellowships in 2009 and is the largest cohort of women ever recognised in a round of ARC fellowships at this level,” Professor Sheil said.

“It is an important moment for women in science and research, but the numbers could still be higher. Traditionally, for a range of reasons, female application numbers are low. The ARC is looking at ways to increase the number of females applying to fellowships schemes and I look forward to seeing another increase in the number of female fellows in the future.”

One of the female 2010 Australian Laureate Fellows is Professor Hilary Charlesworth of The Australian National University, in Canberra. Professor Charlesworth spoke at the Award Ceremony and said her new fellowship would allow her to focus on human rights law, in particular barriers to the implementation of international human rights standards.

“This will not only make for better research outcomes; it will extend Australia's international research connections, which are vital for our performance in the increasingly integrated global research system”

– Senator Kim Carr

FELLOWSHIPS



Professor William Laurance speaking at the awards ceremony.
Photo courtesy Romy Photographics.

“The Fellowship research will draw on regulatory scholarship to analyse the ways that states respond to human rights principles, focussing particularly on the notion of ritualism,” Professor Charlesworth said.

“The project will document techniques of ritualism employed in the international human rights system and explore their relationship to the weaknesses and failures of that area of law.

“We will study a range of countries and human rights institutions to see how and why ritualism comes about. The project has the support of the UN High Commissioner for Human Rights and it will be a marvellous experience for the team to work with her office.

“The aim of the research is to identify ways of transforming human rights ritualism so that it does not undermine human rights commitments, for example, developing strategies to encourage self-regulation in a human rights context,” she said.

Professor Charlesworth also spoke about how the *Australian Laureate Fellowship* funding will enable her to work with a group of new researchers: both PhD students and postdoctoral fellows.

“A great privilege of academic life is the opportunity to work with generations of young and brilliant students and to be constantly energised and enlightened by this experience. I have found mentoring younger researchers the most satisfying aspect of my career and the fellowship will allow me to focus on this,” she said.

The *Australian Laureate Fellowships* scheme is providing \$239 million over five years for up to 75 talented research leaders. The first 15 Australian Laureate Fellows were announced in June 2009. Up to 15 fellowships at a value of up to \$3.1 million will be awarded each year.

For more information about the *Australian Laureate Fellowships* scheme, including the biographies of fellows, visit www.arc.gov.au > Media > Announcement Kits > 2010 Australian Laureate Fellows, email ARC-AustralianLaureateFellowships@arc.gov.au or phone +61 2 6287 6600.

Australian Laureate Fellows for 2010

Professor Mark Bradford

University of New South Wales

An Innovative and Advanced Systems Approach for Full Life-Cycle, Low-Emissions Composite and Hybrid Building Infrastructure

Professor Hilary Charlesworth

The Australian National University

Strengthening the international human rights system: Rights, regulation and ritualism

Professor Matthew England

University of New South Wales

Future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation

Professor Bryan Gaensler

University of Sydney

A Survey of the Universe's Magnetism

Professor Peter Goodyear

University of Sydney

Learning, technology and design: architectures for productive networked learning

Professor Min Gu

Swinburne University

An accelerating journey to the new era of Petabyte optical memory systems

Professor Ary Hoffmann

University of Melbourne

New approaches for pest control and maintaining healthy environments under climate change

Professor Margaret Jolly

The Australian National University

Engendering persons, transforming things: Christianities, Commodities and Individualism in Oceania

Professor Hanna Kokko

The Australian National University

Biological adaptation under natural and anthropogenic conditions

Professor William Laurance

James Cook University

Advancing Australian Leadership in Tropical Conservation Science

Professor Lorraine Mazerolle

University of Queensland

Multi-Site Trials of Third Party Policing: Building the Scientific Capacity for Experimental Criminology and Evidence-Based Social Policy in Australia

Professor Paul Mulvaney

University of Melbourne

Molecular Plasmonics—From Single Electrons to Quantum Catalysis and Optical Logic Gates

Professor Amnon Neeman

The Australian National University

Derived categories and applications

Professor Chris Turney

University of New South Wales

Tipping points in Records of Extreme Events in Australasia: Using the Past to Understand and Plan for Abrupt Future Climate Change

Professor Mark Westoby

Macquarie University

Evolutionary ecology of vegetation

RESEARCH in the national interest - enabling the future

Confronting global threats to marine mega-fauna in Northern Australia



Juvenile Green Turtle swimming on the reef at Bonegi in the Solomon Islands. Photo courtesy Simon Foale.

■ The Australian Research Council's (ARC) *Super Science Fellowship* scheme is assisting world-first research that will lead to the identification of priorities for managing the conservation of marine mega-fauna in Northern Australia.

Twenty Australian institutions are currently recruiting the best and brightest young researchers to work on exciting and important science projects under the ARC's *Super Science Fellowship* scheme. These young researchers will play an important role in boosting Australia's research efforts in areas of significant science endeavour. At James Cook University, five new Super Science Fellows will be focused on marine and climate science.

The northern Great Barrier Reef and Torres Strait region is the dugong and turtle "capital of the world". Nowhere else on the planet is there such large populations of these important species, which are globally threatened. The response of these iconic mega-fauna species to climate change and other human influences is the subject of a new ARC *Super Science Fellowship* by Dr Mariana Fuentes in the ARC Centre of Excellence for Coral Reef Studies, headquartered at James Cook University.

Dr Fuentes, who has moved to Australia from Brazil, said that the northern Great Barrier Reef and Torres Strait are home to three turtle populations; the green, hawksbill and the flatback turtles.

"The resilience of these species to climate change is already compromised by reductions in their population sizes due to impacts such as bycatch in nets, hunting, and pollution.

"Now reef managers responsible for stewardship of marine resources face the added challenge of coping with the effects of climate change."

Dr Fuentes' research includes undertaking a risk assessment of how climate change will affect green turtles.

"Sea turtles are particularly vulnerable to climate change because they lay their eggs on beaches that are prone to increasing sea levels, storm surges and cyclonic activity," she said.

"One of the major effects of climate change will be on the gender balance of the turtle population. The sex ratio of hatchlings is sensitive to temperature, and a warmer climate will increase the number of females in the population. There is the potential for low-cost strategies to minimise increasing temperatures at the nesting sites, and my research will focus on developing ways to protect eggs and nesting sites.

"One of the predicted features of climate change is an increase in sea level and the severity of tropical storms in the northern Great Barrier Reef—these have the potential to destroy nesting sites and to adversely influence annual nesting which overlaps with the cyclone season.

"Extreme weather events also damage the seagrass habitats where dugong feed, causing the animals to move away or delay breeding, neither of which is good for the local indigenous peoples," Dr Fuentes said.

Dugongs and turtles have spiritual and social importance to Australia's indigenous peoples. The Super Science Fellowship will build on Dr Fuentes' extensive experience working with

At James Cook University, five new Super Science Fellows will be focused on marine and climate science.

Fellowships



“Sea turtles are particularly vulnerable to climate change because they lay their eggs on beaches that are prone to increasing sea levels, storm surges and cyclonic activity.”

– Dr Mariana Fuentes

Dr Fuentes measuring and tagging a green turtle with the help of a Torres Strait Islander on Bramble Cay in the Torres Strait. Photo courtesy Dr Mariana Fuentes.

Torres Strait Islanders to help them conserve their culturally important megafauna.

Dr Fuentes recently wrote a book for Torres Strait children *Myrtle's battle against climate change*. Myrtle is, of course, a turtle! This book has been distributed to Grade 7 children in the local school campuses of the Torres Strait where it will be used as an educational tool for teachers.

Director of the ARC Centre of Excellence for Coral Reef Studies, Professor Terry Hughes, said the Centre was delighted to have Dr Fuentes as a Super Science Fellow.

“Her research project will be critical to managing population of mega-fauna in the northern Great Barrier Reef and Torres Strait.”

The Fellowship will be undertaken in collaboration with Professors Helene Marsh and Bob Pressey, who have extensive experience with marine megafauna and conservation planning.

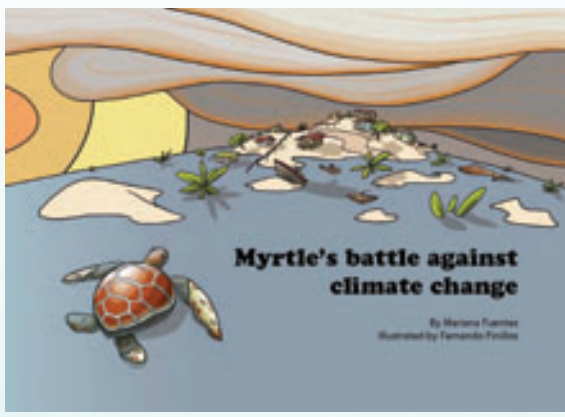
The research is a world first, and will lead to the identification of priorities for management for the conservation of turtles and dugongs. In particular, it will develop a vulnerability assessment framework for multiple species to investigate the cumulative impact of climate on sea turtle nesting rookeries and dugong feeding grounds. It will focus on which cost-effective strategies can be used to minimise the impact of climate change.

One strategy to combat increasing temperature at nesting sites might be the erection of shelters on nesting beaches, to shade the sand and ensure the hatching eggs include enough males to sustain the turtle population.

Professor Marsh said this research will help place Australia at the forefront of understanding and responding to the regional scale impacts of global-warming on tropical societies and economies.

“Knowledge-based management of biodiversity will result in environmental, social and economic benefit to Australia and other tropical maritime nations.”

This project is one of five Super Science Fellowships awarded to the ARC Centre of Excellence for Coral Reef Studies at James Cook University. The others focus on commercially important reef fishes on the Great Barrier Reef; the capacity of both corals and fish to acclimatise and adapt to climate change; and, using genomic studies to investigate the short and long-term response of corals to climate change.



The cover to Dr Fuentes' school book on turtles targeted at Torres Strait school children.

For more information contact Dr Mariana Fuentes mariana.fuentes@jcu.edu.au or visit www.coralcoe.org.au

RESEARCH in the national interest - enabling the future

Centres

Funding world-class research teams

■ **The Australian Research Council (ARC) will fund 13 new Centres of Excellence from 2011 covering research fields such as astrophysics, climate system science, population ageing and quantum technology.**

The funding outcomes for the third round of the *ARC Centres of Excellence* scheme were released on 16 July 2010. The new Centres will share in \$255.9 million over seven years and they are:

- ARC Centre of Excellence for All-sky Astrophysics
- ARC Centre of Excellence for Climate System Science
- ARC Centre of Excellence in Cognition and its Disorders
- ARC Centre of Excellence for Core to Crust Fluid System
- ARC Centre of Excellence for Engineered Quantum Systems
- ARC Centre of Excellence for Environmental Decisions
- ARC Centre of Excellence for Geotechnical Science and Engineering
- ARC Centre of Excellence for the History of Emotions
- ARC Centre of Excellence for Particle Physics at the Tera-Scale
- ARC Centre of Excellence in Plant Cell Wall Biology
- ARC Centre of Excellence in Population Ageing Research
- ARC Centre of Excellence for Quantum Computation and Communication Technology
- ARC Centre of Excellence for Ultrahigh Bandwidth Devices for Optical Systems.

Currently, the ARC is providing funding for 24 ARC Centres of Excellence. These 24 Centres are part of two cohorts—those funded from 2003 and those funded from 2005.

The ARC *Centres of Excellence* scheme brings together outstanding researchers of all levels, and enables them to form world-class, internationally competitive research teams.

ARC Centres of Excellence are typically funded for up to seven years, allowing them the flexibility to undertake comprehensive research programs that tackle Australia's big challenges, as well as short-term projects that answer emerging issues or questions.

The long-term funding, coupled with the prestigious reputation of the ARC Centres of Excellence title, mean that ARC Centres of Excellence become magnets for the world's most talented researchers.

The *ARC Centres of Excellence* scheme also promotes a high level of national and international collaboration. Each centre collaborates with partners from the university sector and other organisations around the globe, facilitating international knowledge transfer that greatly enhances research outcomes.

For more information on ARC Centres of Excellence visit www.arc.gov.au > National Competitive Grants Program > ARC Research Centres > ARC Centres of Excellence

Currently funded ARC Centres of Excellence

2005 COHORT:

- ARC Centre of Excellence in Antimatter-Matter Studies
- ARC Centre of Excellence in Coherent X-ray Science
- ARC Centre of Excellence for Coral Reef Studies
- ARC Centre of Excellence for Creative Industries and Innovation
- ARC Centre of Excellence in Design in Light Metals
- ARC Centre of Excellence for Electromaterials Science
- ARC Centre of Excellence for Free Radical Chemistry and Biotechnology
- ARC Centre of Excellence in Ore Deposits
- ARC Centre of Excellence in Plant Energy Biology
- ARC Centre of Excellence in Structural and Functional Microbial Genomics
- ARC Centre of Excellence in Vision Science

2003 COHORT:

- ARC Centre of Excellence for Advanced Silicon Photovoltaics and Photonics
- ARC Centre of Excellence for Autonomous Systems
- ARC Centre of Excellence in Bioinformatics
- ARC Centre of Excellence for Biotechnology and Development
- ARC Centre of Excellence for Complex Dynamic Systems and Control
- ARC Centre of Excellence for Functional Nanomaterials
- ARC Centre of Excellence for Integrative Legume Research
- ARC Centre of Excellence for Kangaroo Genomics
- ARC Centre of Excellence for Mathematical and Statistical Modelling of Complex Systems
- ARC Centre of Excellence for Quantum-Atom Optics
- ARC Centre of Excellence for Quantum Computer Technology
- ARC Centre for Solar Energy Systems
- ARC Centre of Excellence for Ultrahigh-bandwidth Devices for Optical Systems

Centres

Seeing is believing— science communication with a difference

■ A scientifically fun and interactive outreach program is teaching Australian primary school students about the importance of eye care as well as promoting the virtues of vision research.

The Young Visionaries—early-career researchers from the Australian Research Council (ARC) Centre of Excellence in Vision Science (The Vision Centre)—visit schools to talk about topics such as eye anatomy, colour vision, optics and optical illusions, and diseases of the visual system.

But it's the unique method and props that these early-career researchers use on their 'Vision Days' that engage children so enthusiastically and provide them with sound knowledge about how to look after their eyesight.

One of the most popular activities on Vision Days is wearing a set of goggles that mimic the restricted vision experienced by people suffering from common eye diseases—once placed over the child's eyes they are able to experience what it feels like to live with vision impairments.

One of the common catch phrases from students who wear the glasses is 'Wow! My nana has this. It's so blurry'.

This demonstration is helping students understand why they need to protect their vision now to ensure they maintain good eyesight in the future.

The Young Visionaries program is designed to engage scientist and student alike.

"We're learning that science communication isn't just a one-way street. You have to keep the students interested, encourage their curiosity," said PhD student Shaun New, a driving force behind the Vision Days.



The Young Visionaries (Faran Sabeti, Shaun New, Rizalyn Albarracin, Yu-Shan Hung, Lisa Vlahos, Samuel Inverso). Photo courtesy Dorothea Huber, Vision Centre, ANU.



Truen Ibbotson wearing special glasses used by the Young Visionaries to teach school children about blindness. Photo courtesy Sharyn Wragg, RSB, ANU.

Outreach programs such as Vision Days also provide the scientists with a break from their research routines and allow them to share the fruits of their research with the community.

It's clear that Vision Days have been a hit—following a positive response from teachers and students in the Australian Capital Territory (ACT), the program has expanded and is covering even more schools in the ACT and New South Wales, and there are plans to run similar programs in Queensland. Young vision scientists around Australia are also planning to set up similar activities in their states.

In addition to the school program the Young Visionaries also contribute to National Science Week and Questacon (The National Science and Technology Centre), encouraging better eye care through activities and devices.

Although they differ in their location and research interests, the Young Visionaries are inspired by a common goal—to produce and communicate good science that helps people.

The ARC Centre of Excellence in Vision Science is based at The Australian National University in Canberra.

Based on an article written by Mandy Thoo (Julian Cribb and Associates)

For more information on the Vision Centre contact www.vision.edu.au

The Young Visionaries began their activities in late 2007, thanks to a pioneering initiative by Wiebke Ebeling and her three colleagues Riccardo Natoli, Vicki Chrysostomou and Siobhan McCarthy. These Young Visionaries, who at that stage were all PhD students in the Centre, initially proposed the idea for the venture. In recognition of her dedication and leadership in setting up the Young Visionaries, the Centre awarded Wiebke Ebeling the 'Young Visionaries Achievement Award 2009'.



The Pacific elkhorn coral in-situ at Arno Atoll in the Marshall Islands. Photo courtesy Dean Jacobson.

Rare 'elkhorn' coral found in North Pacific Ocean

■ The remote reefs of the North Pacific Ocean have delivered a surprise and rare find for a coral researcher from the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies (CoECCRS).

Dr Zoe Richards discovered what could be the world's rarest coral—the Pacific elkhorn—while conducting underwater surveys of Arno Atoll in the Marshall Islands.

"When I first saw it, I was absolutely stunned. The huge colonies—five metres across and nearly two metres high with branches like an elk's antlers—were unlike any other coral in the Pacific Ocean," Dr Richards said.

"So far I have only located this new population of coral along a small stretch of reef at a single atoll in the Marshall's group... It grows in relatively shallow water along the exposed reef front and, so far, fewer than 200 colonies are known from that small area."

The coral bears a close physical resemblance to the critically endangered—*Acropora palmata*—of the Atlantic Ocean, but genetic analysis has shown it to be a different species.

The discovery is of particular scientific interest because it represents a morphological extreme in this dominant genus of reef building coral.

Whether the Pacific elkhorn is an existing or entirely new species of coral has not been fully resolved because Dr Richards has uncovered that in 1898 a scientist called Gardiner described a coral from the island of Rotuma, near Fiji in the South Pacific, and its description fits that of the Pacific elkhorn.

"Unfortunately, at this stage, we do not have any genetic material of *A. rotumana* to confirm whether or not it is the same species as the Pacific elkhorn."

Dr Richards hopes in the future she will be successful in obtaining a research grant to dive off the isolated and exposed island of Rotuma to obtain samples of *A. rotumana* if it still exists.

Either way the discovery of Pacific elkhorn is good news for shallow water corals which currently face multiple threats from habitat destruction, declining water quality and the effects of climate change.

Professor David Miller, of the ARC CoECCRS and James Cook University, said the discovery showed there was still much to be learnt about remote North Pacific reefs.

"The fact that these colonies might represent a species that has not been seen for over a hundred years (*A. rotumana*) says something about how much we know about the remote reefs of the North Pacific."

Dr Richards' discovery appeared in an article in a recent edition of the journal *Systematics and Biodiversity*.



For more information visit CoECCRS
www.coralcoe.org.au

Dr Zoe Richards collects a sample of an unidentified coral colony at Rongelap Atoll in the Marshall Islands to be included in a phylogenetic analysis that will resolve its identity. Photo courtesy Dr Maria Veger.

Seahorse eye study may help restore human sight

■ They are unique sea animals with majestic charm, distinctive personalities and dancing rituals, but it is now the eye of the humble seahorse that has researchers intrigued and excited.

Seahorses are now helping scientists gain new understanding about how detailed vision develops. This research may open the door to restoring sight in people with age-related blindness.

Researchers at the Australian Research Council (ARC) Centre of Excellence in Vision Science (Vision Centre) have found that the seahorses' eyes share similarities with the human eye, leading to the possibility of imitating the development of the seahorse's fovea to regenerate this vital region of the eye in people with impaired vision.

The fovea is a tiny pit at the back of the eye—less than half a millimetre across—and is located in the centre of the macula region of the retina. It is the source of all our detailed, sharp central vision—we need it for reading, watching television or movies, driving, and any activity where visual detail is of primary importance.

Without a functioning fovea, you are legally blind.

The Centre's Dr Keely Bumsted O'Brien said that the idea for restoring sight is to restore the fovea by imitating its development process.

"Mimicking this development in mammals has proved extremely difficult so far, but our exploration of how seahorses develop their fovea may provide us an alternative pathway that we can adapt to humans," Dr Bumsted O'Brien said.

"A lot of eye diseases, especially those that affect the elderly, stem from degeneration of the foveal region, for example, macular degeneration affects one in every seven people over the age of 50."

The development of seahorses' vision shares certain similarities with that of humans—there is a high density of cones, responsible for colour vision, and no rods, the cells needed for low-light monochrome vision.

"This structure is very similar to that of the human eye, and understanding how it develops in seahorses may help us understand more about how it develops in humans, and how to repair it if it is damaged," said Doctoral research student, Hie Rin Lee.

Hie Rin explains that the Centre investigated the development of the seahorses' vision by measuring the young and adult seahorses' responses in detecting small prey.



© iStockphoto.com/Melissa Fiene

This also led to another similarity with the development of human vision.

"By tracking their development we've also found that younger seahorses have a less developed fovea than do adults. This also applies to humans, as our ability to see fine detail doesn't develop fully until we reach the age of four or five."

The research group also found that seahorses in tropical waters have better vision than to those in darker waters and are exploring how the environment affects the development of the seahorses' sight.

Dr Bumsted O'Brien said her group's research results are opening up exciting new options for study, including how the environment influences the development of our sight.

For more information contact the Vision Centre at www.vision.edu.au

International Student Security

■ **Social and economic security is a prime factor in decisions by international students to select Australia as a study destination, however, until recently little to no academic research has been undertaken on student security.**

In May this year *International Student Security* was released. The book, partly funded by an Australian Research Council (ARC) *Discovery Projects* scheme grant (\$210 000), has been described as the most comprehensive piece of literature on the subject of international student safety. The research was also partly funded by the Monash Institute for Global Movements.

A large number of the world's English speaking countries welcome hundreds of international students to their universities—study abroad has doubled worldwide in ten years with more than three million students globally crossing borders for their tertiary education.

International Student Security takes an informed look at many unresolved issues confronting students and their families, including personal safety, language proficiency, finances, sub-standard housing, loneliness and racism.

The focus of the book is the human security of international students. The underlying objective of the book is to improve the human security of those students.

The research involved in preparing the book was intensive—interviews with 220 international students from 31 countries, 20 domestic students, 20 Australian regulators and 130 persons in New Zealand and China, along with a full review of international research literature.

International Student Security is one of the few studies in this field that examines the important issues in the words of the international students themselves.

The researchers found that the experience of international students differs from that of local students in three ways:

1. the lives of international students are more marginal, lonelier and less informed than those of their peers;
2. the majority of international students in Australia face at least some barriers to communicating in English that affect not just academic progress but also daily life—problems of abuse or discrimination are often associated with communications issues; and
3. there are pronounced differences between local and international students in areas where cultural identity is at play, not just in cross-cultural relations but in domestic life such as looking for rental housing or seeking a job.

The book was the result of years of hard work and commitment from a four-person research team. That team was:

- Simon Marginson—Professor of Higher Education at the Centre for the Study of Higher Education at the University of Melbourne;
- Chris Nyland—Professor of International Business in the Faculty of Business and Economics at Monash University;
- Erlenawati Sawir—a Research Fellow and former international student who graduated with a PhD in socio-linguistics and education at Monash University; and
- Helen Forbes-Mewett—a Research Fellow in the School of Social Sciences at La Trobe University.

Professor Marginson told *The Australian* earlier this year (14 April 2010) that while the empirical work was undertaken in Australia, the book “would speak to the world industry”.

“The research literature says that each of the problems of student security that we identify in our study occurs throughout the English-speaking nations.

“We expect that much of it will resonate in the United Kingdom, our American colleagues find our findings are relevant to them, and it will be read in Asia¹.”

While *International Student Security* is an extensive study of international students in Australia, it also reworks the mainstream approach to international student welfare and empowerment, and tackles the

worldwide problem of lack of adequate coverage of globally mobile persons in national systems of regulation.

The book provides an advanced conception of international student security, encompassing not just social protections but personal freedom and agency. In this work international students are seen not just as consumers but as parallel to national citizens and bearers of educational, legal, industrial, civil, consumer, financial and political rights.

Published by Cambridge University Press, the book has received positive reviews and many have commented on its importance in future academic programs (see reviews on right of page). Its esteem was evident before the formal book release on 21 May 2010—500 copies had sold in Australia prior to this date. At its launch the book was praised by Monash University's Vice Chancellor, Professor Ed Bryne AO, and the Australian Human Rights Commission's Graeme Innes AM.



Some of the most moving praise for the book came from Dang Thi Kim Anh, a doctoral student from Vietnam: “Thanks for making our voices heard... The book is already laying stepping stones to change [international education] for the better, for the benefit of international students, and the sustainable development of the Australian export industry”.

The book recommends a path forward, most notably devising a standardised set of rights and protections for international students.

Professor Marginson said international students have the same needs as local students and should be accorded equivalent rights and protections².

“A more comprehensive and rights-based approach to the security of international students could be obtained through bilateral negotiations between the countries that send and receive them.

“China, India, Malaysia, and other nations should seek a systematic regime of protection and respect for their citizens who study in other countries. As a pattern of bilateral negotiations became established, common global standards could emerge.

“Ultimately, what is required is a set of global protocols involving all relevant nations,” he said.

In signing off on *International Student Security* the researchers highlight the importance of this kind of research and the dissemination of knowledge that is linked to public discussion. They conclude by saying that: “The task of critical social research is to rip the mask from comfortable common sense and discover what is really going on. At best such research helps to foster social openness, movement and reflexive change³.”

For more information contact Professor Simon Marginson email s.marginson@unimelb.edu.au

Australian Research Integrity Committee

Expressions of Interest (EOI) were called for membership of the Australian Research Integrity Committee (ARIC) and closed on 28 May 2010.

The Australian Research Integrity Committee (ARIC) is being jointly established by the National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC) as a national advisory body that will review processes by which universities and other research organisations have handled allegations of research misconduct.

For more information about ARIC visit www.arc.gov.au > Research Integrity or www.nhmrc.gov.au.

Reviews

This book will have an extremely broad and eclectic audience, both academic and lay.

Allan Luke, Professor of Education, Queensland University of Technology

What is most impressive is [the] extensive data collection and analysis of 200 student interviews across 35 countries. The stories are both compelling and memorable... The book is very timely and speaks to a major gap in the literature: a critical examination of international student experiences in the midst of a quickly rising global student market.

Jenny Lee, Director, Centre for the Study of Higher Education, University of Arizona

This book covers the whole broad dimension of international student security... It is likely to appear as a key text in academic programmes throughout the world and its theoretical innovation and empirical findings will be extremely useful.

Rajani Naidoo, Director of Studies, Doctor of Business Administration in Higher Education Management, University of Bath

Marginson, Nyland, Sawir and Forbes-Mewett are realists. They recognise a new world has emerged... They join a long and honourable tradition of social scientists drawing on field work of lived experience to argue for social reform.

Professor Glyn Davis, University of Melbourne Vice-Chancellor (in a review for Australian Literary Review in *The Australian*)

The book's conception of international student security "should be a basic tenet for every nation aspiring to be a global higher education centre". It "shatters the marketing myths and shows a rather different picture, across all Anglophone nations, of the isolated, excluded and too often disenfranchised foreign student... [The] research makes a convincing case for an approach in which we stop treating overseas students as purchasers of a service who are accorded some limited consumer rights, and start seeing them as what they are: people who are due the full complement of human rights".

The Times Higher Education (UK) Editorial, 22 April 2010

Since reading the book, I have been increasingly keen for us to make a difference in the lives of international students... a number will be living and learning in better, safer surroundings because of your work.

Andrew Lee, Urbanest Housing (student accommodation provider)

1 Rights fear for 'outsiders', 14 April 2010, *The Australian*, page 23

2 Rights and protections with the exception of areas such as voting in national elections

3 *International Student Security*, page 466

218 new research projects funded

■ **Conducting research that will contribute to the well-being of our ageing population; developing new energy services for remote communities; and using powerful DNA data to help protect endangered fish species are some of the 218 research projects that will be undertaken following the announcement of new Linkage Projects scheme funding from the Australian Research Council (ARC).**

On 23 June 2010, it was announced that 32 Australian institutions will receive over \$66.7 million—this is part of the Linkage Projects scheme Round Two, for funding commencing in July 2010.

In conducting their research the 32 institutions will forge partnerships with 458 national and international government, private and non-profit organisations.

These partners are contributing a total of \$128.2 million in cash and in-kind support, on top of the Australian Government's \$66.7 million.

The projects cover a vast range of research fields; some of the projects that will be undertaken with the Round Two funding include:

- examining rock bolt failure in underground coal mines, with results aimed at protecting our miners from injury and death (The University of New South Wales);
- developing a new generation high crash energy absorbing barrier aimed at saving lives by reducing the severity of accidents involving road barriers (Queensland University of Technology);
- conducting research that will contribute to the well-being of our ageing population by ensuring their independence, and improving scope for social interaction (Monash University);
- modelling the lifetime social and economic impacts of fragile X syndrome (the most common identifiable cause of inherited intellectual disability) and the benefits of early diagnosis and intervention (The University of Canberra);
- developing synthetic natural gas and biochar from biomass for energy services in remote communities and soil carbon sequestration (The University of Western Australia);
- estimating the potential supply of environmental services by landholders (Charles Darwin University);
- using powerful DNA data to implement critically important programs of captive breeding, restoration biology and landscape genetics for five endangered fish species from the lower Murray Darling Basin (Flinders University); and
- investigating the suitability and optimising the performance of selected halophytes for a variety of soil types and environmental conditions (The University of Tasmania).

The Linkage Projects scheme is part of the Australian Research Council's National Competitive Grants Program, which nurtures the creative abilities and skills of Australia's most promising researchers.

The Linkage Projects scheme aims to:

- encourage and develop long-term strategic research alliances between higher education organisations and other organisations, including with industry and other end-users, in order to apply advanced knowledge to problems and/or to provide opportunities to obtain national economic, social or cultural benefits;
- enhance the scale and focus of research in National Research Priorities;
- foster opportunities for postdoctoral researchers to pursue internationally competitive research in collaboration with organisations outside the higher education sector, targeting those who have demonstrated a clear commitment to high-quality research;
- provide outcome-oriented research training to prepare high-calibre postgraduate research students; and
- produce a national pool of world-class researchers to meet the needs of the broader Australian innovation system.

For more information visit www.arc.gov.au > National Competitive Grants Program, email ARC-LinkageProjects@arc.gov.au or phone +61 2 6287 6600.

Linkage Projects Round 2 funding outcomes—snapshot by State and University

Administering Organisation	Total number of projects	Total funding
Australian Capital Territory	7	\$1,821,857
New South Wales	60	\$19,472,176
Northern Territory	1	\$80,007
Queensland	42	\$10,857,031
South Australia	18	\$4,731,983
Tasmania	2	\$1,425,000
Western Australia	24	\$10,369,506
Victoria	64	\$17,996,010
Total Linkage projects funding	218	\$66,753,570

Social science business research that matters

■ **Researchers at the University of Technology, Sydney (UTS) have received a prestigious award for their Australian Research Council (ARC) funded work on project based alliances.**

The small research team from the UTS was awarded the *Emerald Citation for Excellence in Research* for their publication *Becoming (a) Practice*, which explores identity formation and the innovation of practice in alliance leadership.

The prestigious award recognises leadership and excellence in research published in the world's leading peer reviewed business publications. The top 50 papers are selected from over 15 000 published papers in journals, including: *The Academy of Management Journal*; *Organization Science*; *Administrative Science Quarterly*; *Strategic Management Journal*; *Journal of Marketing Research*; *Journal of Banking and Finance*; and *Applied Economics*.

The UTS Business Academics and publication authors involved in the project were: Professor Stewart Clegg, Dr Tyrone Pitsis and senior researcher Kjersti Bjørkeng. *Becoming (a) Practice* is the outcome of a five-year longitudinal research project funded under the ARC *Linkage Projects* scheme, which followed the leadership team of a large Australian Alliance Program made up of a large public and several private organisations.

The goal was to analyse 'practice' as novel patterns of interaction developed into predictable arrays of activities, changing and transforming while at the same time continuing to be referred to as 'the same'.

In *Becoming (a) Practice* the authors focus on three activity areas: authoring boundaries, negotiating competencies and adapting materiality. They suggest that these are essential mechanisms in the evolution of novel patterns of interaction into established practice.

The case study showed that the alliance was able to achieve above average performance on projects, especially in the area of community consultation and environment, schedule and budget. It was also able to achieve performance under conditions of great uncertainty and risk, and in the face of political opposition.

Professor Stewart Clegg, the project's lead Chief Investigator, said the case changed his views on contracts.

"I gained the view (during a doctorate in Project Management) that projects were governed by contracts that specified nearly everything in the nature of the job.

"What our research team was interested in was how the dynamics of project management and the dynamics of contracts can provide different outcomes.

"Good performance goes beyond the traditional measures of project performance; projects are a living, reflexive process where knowledge, ideas, innovations, and even disappointments and disasters are co-produced and experienced," Professor Clegg said.

The research in this study of practice is differentiated from traditional studies in that it develops a notion of practice as it unfolds, rather than considering already established practices. In this way the authors believe they can provide a better account of the constant change inherent in practices.

The findings of the research have attracted global and national attention and this has led to work on a number of international projects investigating project governance, ethics and trust (with Rodney Turner at Lille, France), and a project on creativity and ideas in project based alliances (with Arne Carlsen SINTEF, Norway).

Most recently the team was asked to collaborate with the International Centre for Complex Project Management (Canberra) to investigate the dynamic and less tangible aspects of project performance and leadership.

And, on the back of the *Linkage Projects* funding, Dr Tyrone Pitsis and Professor Stewart Clegg, along with a multidisciplinary team of researchers, Siggí Gudergan and Shankar Sankaran, within UTS were subsequently awarded ARC *Linkage Projects* funding to investigate the antecedent governance factors that influence project blow out and performance.

For Professor Clegg, Dr Pitsis and Kjersti Bjørkeng this award winning project has greater symbolism than the immense opportunities that have evolved out of it. For the team it is proof that social science business research that is qualitative, sociologically and social psychologically informed and conceptually sophisticated, can achieve significant outcomes.

Dr Pitsis likens the reality of business research in Australia to research in science and medicine—the outcomes are often thought rarely to match the time, money and resources invested.

Professor Clegg said the quality of research should not be judged by its apparent scientificity, because it reduces things to numbers, but by its grasp and contribution of understanding to complex social realities.

"These are the issues managers in projects have to manage every day."

For more information visit www.uts.edu.au

Studying the Earth by scientific drilling beneath the oceans



University of Sydney scientist, Jody Webster, aboard the IODP expedition to the Great Barrier Reef examining a core of ancient reef material. Photo courtesy IODP-Management International (MI).

■ **The sediments and rocks beneath the world's oceans preserve a remarkable record of how the Earth works now and has worked in the past; from this record, we can predict with more confidence how it may work in the future.**

Far out at sea, aboard state-of-the-art deep sea drill ships, around 30 scientists and 30 technicians from across the globe work around the clock drilling thousands of metres deep into the seabed collecting 'cores' of sediment and rock to learn more about how the earth works.

In laymen's terms, these scientists are using an enormous 'apple corer' to collect sediment and rocks beneath the world's oceans. Aboard these multi-million dollar vessels they have a comprehensive array of laboratory and other research equipment. A single two-month expedition can recover thousands of metres of core, which then keep both shipboard and shore-based scientists busy for several years.

Australian geoscientists and microbiologists are involved in ARC funded studies of cores taken through these sediments and rocks, using the latest technology from the Integrated Ocean Drilling Program (IODP).

IODP is the world's largest multi-national geoscience program with an annual working budget of US\$210 million. Membership is led by the United States of America, Japan and Europe; other countries involved are Australia, Canada, China, India, New Zealand and South Korea.

Australia and New Zealand form the Australian and New Zealand IODP Consortium (ANZIC), and the two countries have access to all IODP activities including shipboard and post-cruise research, participation in planning committees and groups, and visits from outstanding scientific speakers.

The rationale for IODP studies includes the realisation that the past is often a key to the future of the Earth. This is an important rationale given current topical issues such as climate change.

IODP's main research fields are:

1. **Environmental change processes and effects**—this covers past rapid climate change and extreme climates, climatic cycles, and the evolution of oceanic currents and boundaries. Ocean drilling has been and will be a key to

understanding past climate change on all time scales and at many locations, and hence in helping predict future climate changes;

2. **Solid earth cycles and geodynamics**—this includes continental breakup and sedimentary basin formation, which is especially important in petroleum exploration; large igneous provinces like the Kerguelen Plateau southwest of Australia; continental crust formation in island arcs; and understanding earthquakes and tsunamis;
3. **The deep biosphere and ocean floor**—'Extremophile' microbes have been shown to live deep beneath the sea floor; they have an enormous biomass and could be of industrial importance. Accumulations of frozen gas hydrates (largely methane) beneath the sea floor are a huge potential energy resource and have been shown to trigger bursts of global warming in the past.

Studies of past changes in climate and global sea level, of past volcanic eruptions, and of earthquakes that generated tsunamis, are obviously of great societal relevance, especially in helping predict the future.

Although IODP is designed as a program of pure science, a better understanding of the sedimentary sequences of poorly known continental margins is important to the petroleum exploration industry. Previous ocean drilling in the Exmouth Plateau off the Australian Northwest Shelf, and off Tasmania, has helped companies better understand some aspects of the petroleum potential of these regions.

Australians have recently been involved in various expeditions using three vessels.

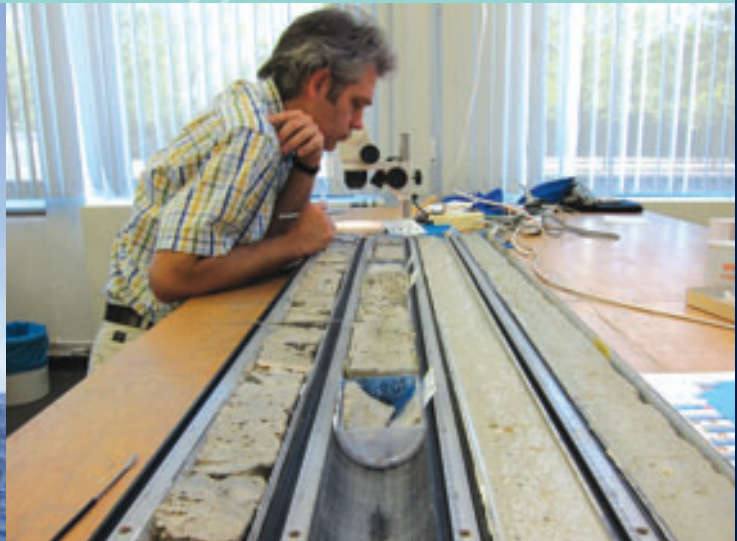
In 2009, six Australian scientists sailed on expeditions in the Northwestern Pacific. An Australian scientist, Dr John Moreau (University of Melbourne), led the microbiological program on an expedition off Japan—the first Australian to sail in this role in the history of ocean drilling. The giant Japanese drillship, *Chikyu*, has and continues to drill south of Japan to investigate the geology of the oceanic trench where the Pacific Ocean crust is plunging beneath the Japanese islands, causing devastating earthquakes and potential tsunamis.

Linkage

L I E F



The *GreatShip Maya* during Great Barrier Reef drilling. Photo courtesy European Consortium for Ocean Research Drilling (ECORD).



A scientist examining sedimentary core material from the Great Barrier Reef IODP expedition. Hard reef limestone on left and soft lime mud on the right. Photo courtesy IODP-MI.

A better grasp of the geology, and the installation of seismometers and other analytical instruments deep beneath the seabed, will help scientists understand and perhaps even predict earthquakes. This technology could perhaps be used later west of Sumatra—where devastating earthquakes and tsunamis have been generated.

The large American drillship, *JOIDES Resolution*, has recently drilled on two expeditions in our region. The first is studying past climates and global sea level fluctuations over the last 15 million years in Canterbury Basin east of New Zealand. The second expedition, in the Australian-claimed Wilkes Land region off Antarctica, is studying the onset of Antarctic glaciation about 33.5 million years ago, and the fluctuations in glacial history since then. The fluctuating cooling trend from the ancient warm greenhouse Earth to the last two million years of largely glacial periods is of inherent scientific interest, and what happened during periods of rapid warming is of great interest to society.

Another drilling expedition has recently used the smaller *GreatShip Maya* to investigate the history of the 120 metre sea level rise in the Great Barrier Reef since the last glaciation about 18 000 years ago; the associated changes in water properties; and the composition of the reef as it migrated landward. Understanding what has happened to the reef as the ocean warmed and sea level rose can help us better understand what might happen to the reef in a future warming world.

Membership of IODP helps Australia and New Zealand maintain leadership in Southern Hemisphere marine research. Our region is the best in which to address various global science problems, and some of them cannot be addressed elsewhere. Accordingly, the Australian region has seen a great deal of ocean drilling activity since 1968, when the first program was established.

Australian scientists participate, through shipboard and post-cruise activity, in cutting edge science by building partnerships with overseas scientists, by being research proponents and co-chief scientists who can steer programs and scientific emphasis, and by having early access to key

samples and data. Post-doctoral and doctoral students have the opportunity of training in marine geoscience that could not be obtained in any other way.

The Australian involvement is supported by the Australian Research Council (ARC), CSIRO, ANSTO and AIMS, MARGO (a marine geoscience peak body) and 14 Australian universities:

- The Australian National University
- The University of Newcastle
- The University of Adelaide
- The University of Queensland
- Curtin University of Technology
- Queensland University of Technology
- James Cook University
- The University of Sydney
- Macquarie University
- University of Tasmania
- The University of Melbourne
- The University of Western Australia
- Monash University
- University of Wollongong

The Australian annual budget is almost \$2.2 billion, of which the ARC provides \$1.55 billion through the *Linkage Infrastructure, Equipment and Facilities* scheme.

The Australian IODP Office is at the Australian National University and is run by Professor Neville Exon.

This article was written by Professor Neville Exon, in conjunction with the ARC.

For more information visit www.iodp.org.au, or contact Professor Neville Exon at neville.exon@anu.edu.au or +61 2 6125 5131.

NEWS IN BRIEF

■ \$21 million for Stem Cell Science

The Australian Research Council (ARC) will administer a \$21 million *Special Research Initiative in Stem Cell Science* that will further build Australia's capacity to conduct stem cell research.

The stem cell research fund will boost research in a field that may hold the key to curing conditions such as heart disease, diabetes and stroke.

Funding for the ARC *Special Research Initiative in Stem Cell Science* will commence in July 2011 and be offered for up to seven years.

For more information visit www.arc.gov.au > National Competitive Grants Program > Special Research Initiatives > Stem Cell Science

■ Native animals learning to survive through taste

Researchers at the University of Sydney are training our native animals to avoid invasive species like the deadly cane toad through conditioned taste aversion (CTA).

Professor Rick Shine, Stephanie O'Donnell and Dr Jonathan Webb trained a group of 62 young quolls to associate cane toads with feeling sick.

The research, which received \$625 000 under the Australian Research Council *Linkage Projects* scheme, could provide conservationists with a vital new weapon in the fight against invasive species.



Honours student Stephanie O'Donnell releases a trained toad-smart northern quoll (*Dasyurus ballucatus*) on a rocky site in the Northern Territory. Photo courtesy Dr Jonathan Webb.

The method was to feed the quolls a small toad that was laced with a nausea-inducing drug (thiabendazole). The cane toad, which weighed less than two grams, was not large enough to kill the quoll but the chemical made them feel sick. Following this two quoll groups—CTA trained and not trained—were given a small, live cane toad in a plastic container to see whether or not they attacked it.

In research that was documented on video the trained quolls can be seen 'turning their noses up' at the cane toads.

Dr Webb said that aversion remained when the quolls were released back into the wild. After fitting radio collars to both groups of quolls, Stephanie O'Donnell and a team of volunteers monitored their survival in the field. Encouragingly, 'toad-smart' quolls survived up to five times longer than 'toad-naive' quolls.

According to Professor Shine the next challenge was to see if their research results could be scaled up to make a difference to wild populations of endangered predators like quolls, goannas and bluetongue lizards.

"First, we have to check that the aversion we create to cane toads is long-lasting. If it is, the next step is to refine our delivery methods—for example, perhaps wildlife agencies could aerially deploy 'toad baits' ahead of the cane toad invasion front to educate quolls to avoid attacking cane toads before the toads invade."

Cane toads are highly toxic when eaten and have driven the northern quoll to extinction in many parts of northern Australia.

These research results, including behavioural video footage, were published in the *British Ecological Society's Journal of Applied Ecology* in April 2010.

For more information visit www.usyd.edu.au

■ Catchment management promoted through Engaging Visions

A creative new approach to research has culminated in the launch of a new book which highlights in pictures ideas and values about the environment, in particular catchment management issues.

The book *Engaging Visions: Engaging Artists with the Community* brings together artwork inspired by four research project field study programs that took place in the Murray Darling Basin between 2007 and 2009.

The Engaging Visions research project, an initiative of the Australian National University (ANU) and the Murray Darling Basin Commission, was funded by the Australian Research Council through the *Linkage Projects* scheme; the ANU was awarded \$309 674 to undertake the project.

The project used field studies to bring local communities and artists together to share ideas on environmental management and sustainability. These ideas and values were later translated into a range of different media, including photography, painting and sculpture.



A total of 63 artists took part in the project and contributed to an exhibition (during August at the ANU) that concluded the field study programs.

ANU Vice-Chancellor and President, Professor Ian Chubb, said the project draws on the University's strengths in research and practice across the arts, science communication, and art education fields, to address matters of national concern in creative ways.

"The environmental health of the planet is a matter of critical importance to humanity. Any strategy that may lead to a more responsive society should be tested and, if viable, implemented," Professor Chubb said.

A Chief Investigator on the project, Dr Rod Lamberts, said that *Engaging Visions* has helped refine best-practice guidelines for community engagement with artists that could be rolled out across Australia.

"The project provides a clear message to art schools and other institutions that they can broaden their interaction and have a significant impact on catchment management," said Dr Lamberts.

For more information about *Engaging Visions*, the project and book, visit www.engagingvisions.com.au or www.cpas.anu.edu.au/engagingvisions

■ Breakthrough coral study

A breakthrough discovery made by researchers at the Australian Research Council Centre of Excellence for Coral Reef Studies (CoECRS) has linked coral immunity with susceptibility to bleaching and disease.

The study of coral immunity will enable scientists to better pre-empt the effects of different stresses on corals.

The discovery was made by PhD candidate Caroline Palmer, Professor Bette Willis and Professor John Bythell, scientists from the CoECRS at James Cook University in Queensland and Newcastle University (UK).

"Understanding the immune system of reef-building corals will help to reduce the impact of coral diseases and environmental stresses," said Caroline Palmer.

"Potentially, this will enable us to more accurately predict the vulnerability of coral reefs to disease and bleaching, before there are obvious signs of stress."

"Variation in levels of immune function among different species is likely dependent on the energy they assign to it. As energy is vital for an effective immune response, corals that utilise energy to grow and reproduce rapidly have less to spare for their immune response."

Two of the main factors that cause corals to bleach are attacks by disease-causing microbes and temperature stress. It is currently estimated that between three and six per cent of corals in the Great Barrier Reef are affected by coral diseases, and up to a third of corals at a given location can be affected by temperature stress in a warm year.

This research was published in the June 2010 issue of *The Federation of American Societies for Experimental Biology (FASEB) Journal*.

For more information visit www.coralcoe.org.au or contact the CoECRS +61 7 4781 4000 or info@coralcoe.org.au

■ Research finds many artists doing it alone

The case to support individual Australian artists has been strengthened through research at the Australian Research Council Centre of Excellence for Creative Industries and Innovation (CCI) at the Queensland University of Technology.

The Centre has found, in its latest research for the Australia Council for the Arts, that Australia's artists are overwhelmingly sole traders or self-employed at a level five times that of the workforce at large.

"This means that not only are most artists doing all they can to support themselves in their work, but it strengthens the case for the community to help them do so, if individual artistic creativity and excellence is to flourish in this country," said CCI Director, Professor Stuart Cunningham.

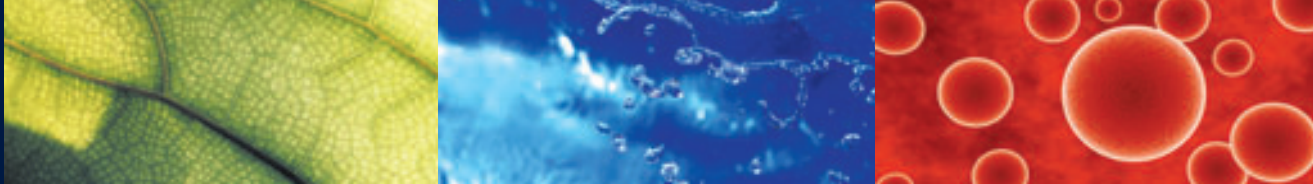
"Our research took in the changing situation of artists over the last three censuses, which demonstrate the highly flexible nature of arts work."

Other findings from the research include:

- over 50 per cent of people employed in artist occupations are sole practitioners—this is five times the rate of the Australian workforce as a whole, in which only ten per cent are not employees;
- part-time employment in the arts is a much higher percentage (44 per cent) than that compared to the workforce as a whole (32 per cent)—the performing arts percentage is even higher (69 per cent);
- 12 370 artists had jobs in other sectors compared with 11 550 who only worked in the arts sector; and
- there are almost twice as many people working in arts related occupations (38 750), primarily design occupations, in other industries than there are in the arts sector (22 320).

The research is one of two investigations into the working lives of Australia's artists released by the Australia Council in August 2010 in its report *Artist Careers*.

For more information contact Professor Stuart Cunningham, Director CCI, s.cunningham@qut.edu.au or visit www.cci.edu.au



ERA Submission process successfully completed

■ **The first round of the Excellence in Research for Australia (ERA) evaluation is now in its final stages with all 41 institutions successfully submitting and certifying their data for ERA 2010.**

The submission period was a very busy time for both the institutions and the ERA team at the Australian Research Council (ARC).

ARC Chief Executive Officer, Professor Margaret Sheil, congratulated all 41 universities.

“This is an exceptional effort on behalf of the sector and the ERA team in the ARC.

“The ERA initiative will provide Australia with important information about the research performance, by research field, in each university. It will also produce

data that allows us to measure Australia’s research performance against the rest of the world.

The ERA 2010 evaluation period has commenced and includes evaluation for all eight ERA clusters. The ERA 2010 Research Evaluation Committees were announced in September.

More information about the ERA evaluation process is contained in the *ERA 2010 Evaluation Guidelines* which are published on the ARC website.

For more information on ERA visit www.arc.gov.au > Research Excellence

Important dates: current ARC scheme rounds

Scheme	Announcement*
Discovery Projects For funding commencing 2011	October 2010
Discovery Indigenous Researchers Development For funding commencing 2011	October 2010
Linkage Projects (Round 1) For funding commencing January 2011	October 2010
Future Fellowships For funding commencing 2010	November 2010
Linkage Infrastructure, Equipment and Facilities For funding commencing 2011	November 2010
Special Research Initiatives: Special Research Initiative in Stem Cell Science	Early 2011
Linkage Projects (Round 2) For funding commencing July 2011	May 2011 (proposals close 17 Nov 2010)

* Announcement dates are indicative only and subject to change

SUBMITTING ARTICLES

The ARC welcomes suggestions and articles for *Discovery*. Articles may be edited for style and length. Edited articles are referred to authors before publication for correction and feedback. There is no guarantee that all submitted articles will be published. Submissions should be sent to publications@arc.gov.au

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