

# Summary of Discovery Projects Proposals for Funding to Commence in 2009

## New South Wales

### Macquarie University

**DP0987218** Dr AP Allen; Dr V Savage; Dr JF Gillooly

**Approved Project Title** **Predicting Biodiversity from Population Dynamics**

**2009 :** \$ 75,000

**2010 :** \$ 75,000

**2011 :** \$ 75,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** Macquarie University

#### Project Summary

This research aims to deepen our understanding of how changes to the environment, including those attributable to human activities, influence the ecological and evolutionary mechanisms that generate and maintain biodiversity. This understanding is of urgent importance, in light of the predicted changes in climate and habitat over the next century, because biodiversity is critical to the proper functioning of ecosystems that human societies depend upon. The graduate student involved in this research will have the opportunity to receive in-depth training as part of a cross-disciplinary collaboration that combines mathematics, ecology, evolution, and paleontology.

**DP0986021** Dr AB Barron; Dr JL Cornish; Dr R Maleszka

**Approved Project Title** **Vulnerability to cocaine use: discovering common mechanisms conserved across animal phyla**

**2009 :** \$ 80,000

**2010 :** \$ 70,000

**2011 :** \$ 70,000

**Primary RFCD** 2705 ZOOLOGY

**Administering Organisation** Macquarie University

#### Project Summary

Drug abuse costs Australia an estimated \$ 20 billion each year, and research is urgently needed to understand how drugs cause long-term behavioural dysfunction. Our research will identify the basal cellular mechanisms underlying drug abuse and addiction, which are likely to be the best targets for therapies to prevent and cure addiction. Our findings are also relevant to other neuropsychiatric disorders related to drug abuse (e.g. depression, anxiety) that are on the increase in Australia. Our work will enhance Australia's reputation for neuroscience research, and will provide training for students in neuropharmacology and molecular neurobiology.

**DP0984666** Dr J Brock; Dr BW Johnson; Dr G McArthur

**Approved Project Title** **Cognitive and neural causes of language impairment in autism**

**2009 :** \$ 88,000

**2010 :** \$ 90,000

**2011 :** \$ 95,000

**2012 :** \$ 100,000

**2013 :** \$ 49,285

**Primary RFCD** 3803 COGNITIVE SCIENCE

**ARF** Dr J Brock

**Administering Organisation** Macquarie University

#### Project Summary

Autism affects around 1 in 200 of the Australian population. The social costs of autism are huge, both for people with the disorder and for their relatives and carers. The cost to the Australian economy is estimated at \$5-7 billion each year. The proposed research will lead to better understanding of the causes of autism, from brain structure and functioning through to cognitive mechanisms and symptoms. This will in turn inform genetic research. The comparison of autism and specific language impairment (SLI) will help determine whether remediation strategies for SLI are likely to be applicable to autism. The project will establish Macquarie University as Australia's first centre for neuro-cognitive autism research.

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**DP0984948** Dr KR Brooks  
**Approved Project Title** **Driving in the Fog: Speed Illusions Caused by Variations of Object Contrast**  
**2009 :** \$ 32,000  
**2010 :** \$ 30,000  
**2011 :** \$ 30,000  
**Primary RFCD** 3801 PSYCHOLOGY  
**Administering Organisation** Macquarie University

### Project Summary

Accurate judgement of the speed of 3D motion is essential to many real world tasks, from driving a vehicle to playing sports. Illusions of perceived speed can occur when the range of brightness levels (ie. the contrast) is reduced, such as in fog, when suffering from cataracts, or when using some sunglasses. This raises issues of safety for drivers (pilots/captains etc). It is expected that advances in the understanding of these effects will inform road safety policy and practice to benefit drivers and pedestrians and to guide the manufacturing of eyewear and display devices (eg. military heads-up-displays). It is also anticipated that this project will be able to answer the much-debated question 'What colour should cricket balls be?'

**DP0986420** Dr DC Burke; Dr R Palermo; Dr MA Williams; Dr S Favelle  
**Approved Project Title** **The human face as an evolved signalling system**  
**2009 :** \$ 60,000  
**2010 :** \$ 75,000  
**2011 :** \$ 50,000  
**Primary RFCD** 3801 PSYCHOLOGY  
**Administering Organisation** Macquarie University

### Project Summary

This project will, for the first time, thoroughly investigate the role that facial movement plays in human non-verbal communication. It will uncover the subtle, dynamic signals that are exchanged in almost all everyday social encounters, enriching our understanding of human communication and forming a solid basis for detecting intentions from an analysis of facial movements, with the obvious security benefits that entails.

**DP0985138** Prof AE Castles; Prof K Nation  
**Approved Project Title** **Learning to read words: Beyond alphabetic skills**  
**2009 :** \$ 60,000  
**2010 :** \$ 40,000  
**2011 :** \$ 80,000  
**2012 :** \$ 20,000  
**Primary RFCD** 3801 PSYCHOLOGY  
**Administering Organisation** Macquarie University

### Project Summary

Up to 20% of Australian children experience difficulties in learning to read. Many of these children are unable to sound out words, and a focus on teaching these skills in Australian classrooms was a key recommendation of the recent National Inquiry into the Teaching of Literacy. However, some children make slow progress in reading despite having good sounding out skills, demonstrating that more than just this ability is needed for proficient reading. This project explores how children progress in reading once they have learned to sound out, and examines why some poor readers have difficulty doing so. The findings will inform the teaching of reading and will assist in the development of interventions for children with reading problems.

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**DP0985680** Prof M Coltheart

**Approved Project Title** **A new theory of visual word recognition and reading aloud**

**2009 :** \$ 102,000  
**2010 :** \$ 90,000  
**2011 :** \$ 90,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** Macquarie University

### Project Summary

The results of this research will lead to an improvement in the theory of reading, which will in turn improve the quality of advice to speech pathologists, teachers, parents and the broader community about children's reading difficulties and their treatment.

**DP0988678** Prof KP Esselle; Dr Y Ge; Prof TS Bird

**Approved Project Title** **High-Performance Microwave and Millimetre Wave Antennae Based on Multi-layer Periodic Structures**

**2009 :** \$ 60,000  
**2010 :** \$ 60,000  
**2011 :** \$ 60,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** Macquarie University

### Project Summary

Broadband communication has created a rapidly growing market for innovative microwave communication systems such as WiFi and WiMAX. Millimetre-wave technology is expected to deliver the next leap in communication technology with much faster wireless links for 3D TV etc. By developing innovative, low-cost, planar antennas with high performance, the proposed research will create opportunities for Australian industry to compete in this growing global market with advanced, cost-effective, microwave and millimetre-wave products. The Australian research community will benefit from new methods, techniques and trained researchers, while Australian consumers will benefit from improved quality and low cost of services.

**DP0986934** Dr K Gleeson

**Approved Project Title** **The Parliamentary Politics of Abortion Reform in Australia: The Diverse Experience of Nine Jurisdictions, 1965-2010**

**2009 :** \$ 80,000  
**2010 :** \$ 78,000  
**2011 :** \$ 76,000  
**2012 :** \$ 70,000

**Primary RFCD** 3601 POLITICAL SCIENCE

APD Dr K Gleeson

**Administering Organisation** Macquarie University

### Project Summary

Abortion is an important political consideration that is implicated in portfolios ranging from reproductive health, to foreign aid and immigration policy. Through extensive archival research and interviews, this project will provide new information about how politicians make decisions on abortion, where they get their information on abortion, and how they understand their representational roles vis-à-vis their constituents. It will contribute new knowledge to the study of democratic representation; provide a new model for the neglected area of the study of comparative state differences; and heighten Australia's research profile in two areas of increased international interest: both abortion and conscience votes.

## Summary of Discovery Projects Proposals for Funding to Commence in 2009

**DP0987839** Prof M Goot; Dr SR Scalmer

**Approved Project Title** **Remaking Australian Politics: Electioneering from the 19th Century to the 21st**

**2009 :** \$ 184,000  
**2010 :** \$ 140,000  
**2011 :** \$ 145,000  
**2012 :** \$ 101,000  
**2013 :** \$ 115,000

**Primary RFCD** 3601 POLITICAL SCIENCE

**APF** Prof M Goot

**Administering Organisation** Macquarie University

### Project Summary

Critics have lamented the apparent decline of elections as meaningful opportunities for rational deliberation; journalists' election reports increasingly focus on campaign methods; politicians have expressed alarm at how little Australians know about Australia's democratic history. This project, the first long-term study of electioneering in Australia, will address each of these issues. It will provide a scholarly perspective on sometimes overstated claims of contemporary decline. It will offer journalists and political professionals' insights into changing campaign practices. And it will produce an accessible account of the significance and history of elections for a new generation of Australians, thereby strengthening democratic life.

**DP0984852** Prof WL Griffin; Prof SY O'Reilly; Dr NJ Pearson; Prof T Stachel; Prof O Navon; Dr JW Harris

**Approved Project Title** **Diamond genesis: cracking the code for deep-Earth processes**

**2009 :** \$ 157,000  
**2010 :** \$ 120,000  
**2011 :** \$ 120,000

**Primary RFCD** 2603 GEOCHEMISTRY

**Administering Organisation** Macquarie University

### Project Summary

The project will provide new insights into the processes by which diamond crystallises in the Earth's mantle, and will deliver information directly relevant to interpreting the diamond prospectivity of the Australian continent. The development of a new diamond mine in Australia, or by Australian companies abroad, would be a major addition to the economy and Australian-based industry. Another outcome of this research will be further development of methodologies for identification of sources of individual diamonds, relevant to the international Kimberley Process for reducing theft and illegal diamond trade. The project will be a highly visible Australian contribution to this global social and economic problem.

**DP0985595** Prof A Jamalipour; Dr M Kibria

**Approved Project Title** **Pervasive Data Dissemination Framework Using Intermittently Connected Mobile Ad Hoc Networks for Emergency, Medical, and Rural Applications**

**2009 :** \$ 120,000  
**2010 :** \$ 75,000  
**2011 :** \$ 75,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** Macquarie University

### Project Summary

Australia and many other countries face the problem of disseminating vital medical, local, and personal data in case of emergency and natural disasters when the main telecommunications infrastructure is disrupted. A similar outreach problem exists in rural areas where such infrastructure doesn't exist or is limited. This project aims at providing a feasible data dissemination solution for such disruptions. It also promises a new framework for regular data communications in rural areas through efficient inter-connection with commercial networks. Upon completion, Australia will be in forefront of technologies related to the increasingly important theme of emergency and medical communications and data delivery, amongst other applications.

## Summary of Discovery Projects Proposals for Funding to Commence in 2009

**DP0988088** Dr M Kavakli  
**Approved Project Title** **A Gesture-Based Interface for Designing in Virtual Reality**  
**2009 :** \$ 80,000  
**2010 :** \$ 70,000  
**2011 :** \$ 70,000  
**Primary RFCD** 2801 INFORMATION SYSTEMS  
**Administering Organisation** Macquarie University

### Project Summary

Many design professions including architecture, fashion, and engineering can benefit from the outcomes of this project and may return financial benefits to Australia, since they heavily rely on sketching in the conceptual design process. Other areas, such as films, computer games, user interface design that involves storyboarding and visualization may also benefit from sketching in virtual reality. Further research may be carried out using a variety of VR facilities and a responsive workbench (3D interactive table-top display) to allow distributed Virtual Prototyping between geographically separated design teams, to assemble the product drawn using a force feedback device to place Australia in a leading position.

**DP0987892** Dr JS Madin  
**Approved Project Title** **Ecological consequences of hydrodynamic disturbances**  
**2009 :** \$ 90,000  
**2010 :** \$ 40,000  
**2011 :** \$ 40,000  
**Primary RFCD** 2799 OTHER BIOLOGICAL SCIENCES  
**Administering Organisation** Macquarie University

### Project Summary

The Great Barrier Reef is synonymous with Australia to many people worldwide. Consequently, it is of paramount importance to our national tourism industry. As stewards of this unique ecosystem, we are responsible for ensuring its persistence under not only present, but also future climate scenarios. To do so requires the tools for predicting the ecological impacts of physical disturbance that this project will develop. Because of its global significance, this work will continue to generate high-impact publications that will increase the international research profile of Australia. Finally, this project will generate collaborations with top researchers worldwide and will provide high quality training to postgraduate students.

**DP0987734** Prof JP Pieprzyk; Dr R Steinfeld; Prof AK Lenstra  
**Approved Project Title** **Secure and Efficient Cryptographic Hashing**  
**2009 :** \$ 110,000  
**2010 :** \$ 100,000  
**2011 :** \$ 100,000  
**2012 :** \$ 103,570  
**2013 :** \$ 98,570  
**Primary RFCD** 2804 COMPUTATION THEORY AND MATHEMATICS  
ARF Dr R Steinfeld  
**Administering Organisation** Macquarie University

### Project Summary

This project will enhance information security, which is absolutely crucial for rapidly growing e-commerce, e-government services and for national security (Priority 4 -Safeguarding Australia - Protection against Terrorism and Crime). The project will strengthen international collaboration by reciprocal exchange of researchers and postgraduate students leading to more attractive and productive research environment. At the same time, the project will help to maintain high research profile of Australian researchers, to increase the capacity for consultancy and contract work, and provide a cutting-edge information technology for the Australian telecommunications industry, business and government (Priority 3 - Frontier Technologies).

## Summary of Discovery Projects Proposals for Funding to Commence in 2009

**DP0984494** Dr AN Rich; Dr TS Horowitz

**Approved Project Title** **Keeping track: The effect of distraction on attention to moving objects**

**2009 :** \$ 120,000

**2010 :** \$ 100,000

**2011 :** \$ 133,000

**Primary RFCD** 3801 PSYCHOLOGY

**APD** Dr AN Rich

**Administering Organisation** Macquarie University

### Project Summary

This is basic research with broad societal implications. We constantly balance the attention demands of achieving a goal (e.g., driving) in the midst of competing environmental demands (e.g., attention-grabbing advertising). Billions of dollars are spent trying to make our roads safer, but basic research is critical to inform policy and design. There are three main benefits in identifying distractions that impair performance on a task that requires attention to moving objects. It will: (1) develop a method for exploring attention demands on real-world experiences (e.g., driving); (2) inform policy decisions on safer environments; and (3) provide a basis for minimising distractions in environments for people with attentional difficulties.

**DP0986232** Dr TA Rushmer

**Approved Project Title** **Partial melting in natural metal-silicate and silicate systems: rheological and geochemical implications for the Earth and other planets**

**2009 :** \$ 70,000

**2010 :** \$ 55,000

**2011 :** \$ 60,000

**Primary RFCD** 2601 GEOLOGY

**Administering Organisation** Macquarie University

### Project Summary

Understanding how fluid and melts migrate through the Earth's crust is vital to predicting how important minerals, metals and oil can be concentrated. Understanding fluid-rock systems therefore contribute to an environmentally sustainable Australia (Research Priority 1). Furthering our knowledge of permeable networks through the use of dynamic experiments is an innovative way to study their development within naturally evolving crustal systems as they respond to changing physical and chemical conditions. Thus, this proposal is also directly concerned with the continuing aim of building a sustainable Australia through knowledge of deep Earth resources.

**DP0987182** Prof WF Thompson; Prof C Palmer

**Approved Project Title** **Vocal Emotional Communication**

**2009 :** \$ 92,000

**2010 :** \$ 98,000

**2011 :** \$ 105,000

**Primary RFCD** 4101 PERFORMING ARTS

**Administering Organisation** Macquarie University

### Project Summary

Understanding vocal emotional communication (VEC) has health, social, educational, economic and political benefits. Outcomes include: Development of an Australian test of sensitivity to emotional signals in (prosody) speech rhythms; Characterisation of emotional signals in music and speech; Understanding congenital impairments in music and speech prosody; Elucidating the cognitive basis of motor planning and facial expressions in VEC; and internationalisation of motion capture research. Potential benefits include training programs in VEC for individuals with social adjustment problems or for people involved in sensitive cross-cultural interactions; enhancement of music pedagogy programs; and construction of effective warning and alert signals.

## Summary of Discovery Projects Proposals for Funding to Commence in 2009

**DP0988658** Prof SP Turner; Dr A Dosseto; A/Prof M Reagan

**Approved Project Title** **Application of very short-lived Uranium-series isotopes to constraining Earth system processes**

**2009 :** \$ 98,000  
**2010 :** \$ 98,000  
**2011 :** \$ 98,000  
**2012 :** \$ 103,000  
**2013 :** \$ 103,000

**Primary RFCD** 2603 GEOCHEMISTRY

APF Prof SP Turner

**Administering Organisation** Macquarie University

### Project Summary

This proposal is directly concerned with the continuing aim of building a sustainable Australia through knowledge of deep earth resources. Uranium series isotopes are relevant to the very recent history of the planet (< 350 000 years) - time scales which are often over-looked. The more we know about the rates of processes the better we will be able to inform models for volcanic hazard mitigation, soil sustainability and resource exploration and safeguarding. It is to these techniques we must look if we are to understand the immediate past as a clue to the immediate future of our planet.

**DP0986386** Prof MJ Wardle; Prof BM Gaensler

**Approved Project Title** **Massive black holes in the hearts of galaxies**

**2009 :** \$ 200,000  
**2010 :** \$ 150,000  
**2011 :** \$ 150,000

**Primary RFCD** 2401 ASTRONOMICAL SCIENCES

**Administering Organisation** Macquarie University

### Project Summary

This research will create new insights into the extreme physics of supermassive black holes at the centres of galaxies. Using new instrumentation and analysis techniques to measure the polarisation and variability of their radiation, we will develop models for the infall of gas, the structures surrounding black holes and the merger of massive black holes over cosmic time. The new observing modes that we will develop will provide stepping stones toward the Square Kilometre Array, a multi-billion dollar project from which Australia stands to reap enormous scientific and economic benefit. The major advances that we will deliver will boost Australia's already outstanding track record as a world leader in astronomical discovery.

**DP0984919** Dr MA Williams

**Approved Project Title** **How does the brain process facial expressions?**

**2009 :** \$ 118,000  
**2010 :** \$ 118,000  
**2011 :** \$ 130,000  
**2012 :** \$ 58,610  
**2013 :** \$ 185,000

**Primary RFCD** 3801 PSYCHOLOGY

QEII Dr MA Williams

**Administering Organisation** Macquarie University

### Project Summary

Humans are social animals and we rely heavily on facial expressions to give us cues to other peoples' thoughts. In many disorders, such as autism and schizophrenia, this ability is compromised, causing considerable difficulties in social functioning. The results of this study will increase our understanding of the way the brain processes facial expressions, using new brain imaging methods. This knowledge will inform clinical research into disorders involving social impairments. The new techniques developed in this study will also provide Australian researchers with cutting-edge methods, raising the profile of Australian cognitive neuroscience research.