

# Summary of Discovery Projects Proposals for Funding to Commence in 2010

## New South Wales

### Macquarie University

**DP1095346** Dr MA Batanin; A/Prof C Berger

**Approved Project Title** **Functorial operadic calculus**

**2010 :** \$ 80,000

**2011 :** \$ 80,000

**2012 :** \$ 80,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** Macquarie University

#### Project Summary

Further progress in the foundations of quantum physics, algebra and geometry requires a development of mathematical theories governed by the complicated algebra of higher-dimensional substitutions. The study of this algebra is the main focus of this project. It will allow Australia to remain at the forefront of research into the fundamental laws of Nature and subsequent technological development and to reap the economic, social and intellectual benefits related to this development

**DP1093444** Dr MJ Bishop

**Approved Project Title** **More than mud: how will disruption of soft-sediments threaten coastal biodiversity?**

**2010 :** \$ 90,000

**2011 :** \$ 80,000

**2012 :** \$ 80,000

**2013 :** \$ 70,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** Macquarie University

#### Project Summary

Habitat destruction and increased nutrient input are combining with climate change to threaten the biodiversity and fisheries productivity of soft sediment habitats that dominate Australia's sixteen million square kilometre exclusive economic zone. This project will develop the tools necessary for the sustainable management of our coastal biodiversity under multiple scenarios of change. Because many of the results will be broadly applicable to coastal systems worldwide, this project will generate high-impact publications that will increase the research profile of Australia. It will train postgraduate students in strategies to help ensure the sustainable use of our biodiversity and will generate collaborations with leading international scientists.

**DP1094758** A/Prof G Brennen

**Approved Project Title** **Topological order and anyons: quantum engineering of emergent physics**

**2010 :** \$ 97,373

**2011 :** \$ 100,000

**2012 :** \$ 100,000

**Primary RFCD** 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

**Administering Organisation** Macquarie University

#### Project Summary

Australia is recognized as one of the world leaders in the area of quantum information and computation. As a frontier technology with tremendous potential but engineering challenges it is vital we expand our theoretical landscape to better steer experimental development. A promising new paradigm is topological quantum computation which uses particles with exotic statistics called anyons that do not exist naturally in three dimensions but can be engineered to emerge in two dimensional spin lattices. Our bottom up research program would help place Australia at the forefront of these ideas. As a field which combines tools from mathematics, computer science, and physics this project will provide world class training to young researchers.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1095532** Prof DG Christian  
**Approved Project Title** **Inner Eurasia: A World History of Eurasia's Heartlands**  
**2010 :** \$ 50,000  
**2011 :** \$ 33,000  
**2012 :** \$ 60,000  
**Primary RFCD** 4301 HISTORICAL STUDIES  
**Administering Organisation** Macquarie University

### Project Summary

Inner Eurasia has played a distinctive and significant role in world history, particularly in the twentieth century when it was the heartland of world communism. Australia's history has been shaped profoundly by the political, military, cultural and commercial impact of the region's great empires. This project will expand Australian understanding of the region, and raise Australia's international visibility and competitiveness in both Inner Eurasian and World history. It will attract undergraduate and graduate students and international scholars. Its world history approach will augment Macquarie's significant contributions to the Australian National History Curriculum.

**DP1096160** Prof S Crain; Dr RJ Thornton; Dr BW Johnson; Dr DM Khlentzos; Prof OJ Tzeng; Prof TH Lee; Prof LQ Gao  
**Approved Project Title** **The emergence of logic in child language**  
**2010 :** \$ 110,000  
**2011 :** \$ 122,000  
**2012 :** \$ 138,000  
**2013 :** \$ 131,000  
**2014 :** \$ 100,000  
**Primary RFCD** 3802 LINGUISTICS  
**Administering Organisation** Macquarie University

### Project Summary

This project investigates the development of logical expressions in Chinese and English. The project will promote intercultural awareness by establishing the degree to which typologically diverse languages share core logical properties. The findings are relevant for theories of language acquisition and logical reasoning, and will inform research in Linguistics, Philosophy and Psychology. The Neurosciences will benefit from data obtained using the brain imaging technique, Magnetoencephalography (MEG), for the first time with children, and these data will establish benchmarks for assessing early intervention in treating hearing disorders. The project will enhance collaborative research with Australia's neighbours in East Asia.

**DP1096475** Prof A Cranny-Francis  
**Approved Project Title** **Jack Lindsay: critic, writer, socialist**  
**2010 :** \$ 56,000  
**2011 :** \$ 54,000  
**2012 :** \$ 41,000  
**2013 :** \$ 40,000  
**Primary RFCD** 4203 CULTURAL STUDIES  
**Administering Organisation** Macquarie University

### Project Summary

The national benefits of this project are two-fold. Firstly, it aims to describe the process by which people are able to move beyond conventional ways of thinking and working and to be both creative and innovative, where innovation refers to the ways in which this new creative thought is put into practice as a new product or technology. The other benefit of the project is that it describes the landmark work of an Australian artist and intellectual who is not as well-known as he should be, Jack Lindsay, oldest son of Norman Lindsay. It will provide access to Jack Lindsay's ideas and writing, both analytical and creative, to show how these can contribute to our current need for new and creative ways of working and thinking.

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**DP1095443** Dr M Dras; Dr MM Turpin; Dr O Rambow; Prof R Dale

**Approved Project Title** **Natural Language Generation for Aboriginal Languages**

**2010 :** \$ 145,000

**2011 :** \$ 140,000

**2012 :** \$ 140,000

**Primary RFCD** 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

**Administering Organisation** Macquarie University

### Project Summary

Australian Aboriginal languages have a number of interesting characteristics that make them a challenge for language technology applications; as yet, there are none, unlike for the indigenous Inuit peoples of Canada and Maori of New Zealand. We will carry out a large-scale computational linguistic investigation of an Aboriginal language to create a data-to-text natural language generation system. The system will use data from Australian Rules Football to automatically construct articles based on the data. This study of computational linguistics will have further national benefits through engagement of the owners of the language in the language survey, as well as generating articles that will encourage literacy and language maintenance.

**DP1096857** Prof Dr L Dubrovinsky

**Approved Project Title** **Mineral Physics of the Earth's Core**

**2010 :** \$ 200,000

**2011 :** \$ 180,000

**2012 :** \$ 185,000

**2013 :** \$ 160,000

**2014 :** \$ 100,000

**Primary RFCD** 2602 GEOPHYSICS

**APF** Prof Dr L Dubrovinsky

**Administering Organisation** Macquarie University

### Project Summary

Most information on the nature of Earth's core properties has come from teleseismic studies, which detect weak earthquake-wave signals that have traversed the Earth's deepest interior. These studies have revealed several unusual and enigmatic phenomena in the core, but interpretation of these observations must rely on mineral-physics data on the materials of the core (e.g. iron-based alloys). This project will create a unique world-class ultra-high pressure laboratory to obtain such data. By defining the composition and mineralogy of Earth's core, it will place Australia in the forefront of this exciting research field, and will also represent a major national resource for the study of novel materials at extreme conditions.

**DP1095356** Dr D Dzino

**Approved Project Title** **Ancient and Medieval Identity-shifts and the Construction of Identities in Post-Yugoslav Space**

**2010 :** \$ 65,000

**2011 :** \$ 80,000

**2012 :** \$ 65,000

**2013 :** \$ 65,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**APD** Dr D Dzino

**Administering Organisation** Macquarie University

### Project Summary

The most significant benefit would be in the area of multicultural policies, an area in which Australia is already seen as a model for other countries. Specifically, the issues of acculturation, formation, hybridization, and the disappearance or persistence of ethnic identities over time are integral to developing culturally sensitive and socially advantageous policies of multiculturalism and immigration. Australia also has a significant cultural interest in the Balkans, as large numbers of its citizens perceive cultural identity from the region. For that reason, this research has significant potential to arouse wider community interest, and stimulate dialogue between different communities in Australia.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1092819** Dr TV Evans; Dr JA Lee; Dr JK Aitken

**Approved Project Title** **Words from the sand: A lexical analysis of early Greek papyri from Egypt**

**2010 :** \$ 94,000

**2011 :** \$ 50,000

**2012 :** \$ 77,000

**2013 :** \$ 40,000

**2014 :** \$ 52,000

**Primary RFCD** 4201 LANGUAGE STUDIES

**Administering Organisation** Macquarie University

### Project Summary

The project's central outcomes will be a more systematic knowledge of the development of one of the world's three oldest continually-recorded languages, and insight into the dynamics of lexical usage in different speech communities within a multicultural context. These outcomes will maintain Australia's prominent international role in investigating the history of the Greek language over three millennia, and offer social benefits through study of the interaction of language and social dynamics in Diaspora speech communities and multilingual societies, addressing the National Research Priority Goal of 'Understanding our region and the world' by enhancing Australia's capacity to interpret and engage with its global environment.

**DP1093020** Dr LJ Graham

**Approved Project Title** **A critical analysis of the increase in diagnosis of special educational needs in New South Wales government schools**

**2010 :** \$ 80,182

**2011 :** \$ 80,182

**2012 :** \$ 80,182

**Primary RFCD** 3301 EDUCATION STUDIES

**APD** Dr LJ Graham

**Administering Organisation** Macquarie University

### Project Summary

Enhancing the ability of schools to respond to students with diverse needs has been shown to reduce student disengagement and early leaving. This research will identify ways to achieve this important goal, while reducing incentives for schools to label and segregate students who experience difficulty in schools and with learning. This will have long term benefits not only for individual students, but for communities and for the nation as a whole. The project will contribute to the Commonwealth government's national agenda linking positive educational outcomes to successful employment, broader economic participation, and enhanced social inclusion.

**DP1094295** A/Prof SC Griffith; Dr AF Russell; Prof S Edwards

**Approved Project Title** **To be cooperative or selfish: individual decisions in a model society**

**2010 :** \$ 123,000

**2011 :** \$ 110,000

**2012 :** \$ 65,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** Macquarie University

### Project Summary

Understanding the basis of cooperative behaviour is a major challenge to biological and social science. Our ability to deal with problems such as global warming and the rapid loss of biodiversity, will depend upon an unprecedented level of cooperation between individuals and countries. Our work will use an animal model that shares a number of key characteristics with the societies of our early human ancestors to explore, through experiments and detailed molecular analysis, the basis of cooperative interactions between individuals. This work will uncover the key principles that drive the evolution of cooperation in society and will help us to understand the basis of one the most important components of human nature.

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**DP1095200** Dr GC Hose; Prof JT Ellis; Dr A Stow; Prof H Arndt; Dr DA Nipperess

**Approved Project Title** **Testing the biodiversity-function paradigm for the provision of clean water in aquifers**

**2010 :** \$ 49,000

**2011 :** \$ 81,000

**2012 :** \$ 39,000

**Primary RFCD** 3001 SOIL AND WATER SCIENCES

**Administering Organisation** Macquarie University

### Project Summary

The ability of groundwater microbes to purify groundwater is an incredibly valuable service. All Australians benefit from this natural service either directly by having clean drinking water, or indirectly through the economic benefits of groundwater-reliant agriculture or industries. Clearly, managing aquifers to maintain this process is vital. This project will identify whether the biodiversity of the groundwater ecosystem is important for this process to occur and, consequently, whether management should focus on biodiversity conservation (with its accompanying benefits) or forego biodiversity as a priority and manage the environment to maximise the beneficial ecosystem goods and services it provides.

**DP1094572** A/Prof TA Johnston; Prof B Woll

**Approved Project Title** **New languages seen with new eyes: Evidence for the emergence of grammar in signed languages using new methodologies and technologies**

**2010 :** \$ 120,000

**2011 :** \$ 110,000

**2012 :** \$ 124,000

**2013 :** \$ 30,000

**Primary RFCD** 3802 LINGUISTICS

**Administering Organisation** Macquarie University

### Project Summary

This project will ensure that the education of signing deaf children and the scientific study of human language are based on descriptions of sign language vocabulary and grammar that are supported by empirical evidence from representative samples of naturalistic language. The knowledge is essential for developing assessment and teaching tools for deaf children, for improving the training of sign language interpreters, and for understanding the results of research into human cognition and the processing of language-spoken, written or signed-in the brain. The internet accessible digital video corpus will be an important cultural archive, educational resource and scientific dataset for the on-going research.

**DP1094144** Dr JM Kennett; Dr CL Fry; Dr SC Matthews

**Approved Project Title** **Addiction, moral identity and moral agency: Integrating theoretical and empirical approaches**

**2010 :** \$ 108,000

**2011 :** \$ 67,000

**2012 :** \$ 138,000

**Primary RFCD** 4401 PHILOSOPHY

**Administering Organisation** Macquarie University

### Project Summary

By clarifying and evaluating scientific claims about the moral impacts of addiction on the judgment and practices of drug addicted persons and by investigating the perspectives of users and treatment professionals, our project will contribute to the development of ethical and effective public policy, treatment and education programs in the addictions area, thus helping to address the causes and reduce the impact of biological, social and environmental factors which diminish life potential in drug addicted persons. The innovative features of this project will enhance Australia's international reputation in bioethics and moral psychology, extend the reach of experimental philosophy, and facilitate future interdisciplinary work.

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**DP1093687** Prof SN Lieu; Dr GB Mikkelsen; Dr LD Eccles; Dr JB Markley; Prof N Sims-Williams; A/Prof GB Greatrex; Prof TS Loden

**Approved Project Title** **China and the ancient Mediterranean world**

**2010 :** \$ 70,000

**2011 :** \$ 70,000

**2012 :** \$ 76,000

**Primary RFCD** 4202 LITERATURE STUDIES

**Administering Organisation** Macquarie University

### Project Summary

The project which is part of a large international project aims to investigate the evidence for cultural contact between Rome and China and draws on material which has not been properly studied. Some of this material is of great artistic value (esp. Manichaeon illuminated manuscripts) and has already attracted the attention of national media (newspapers, radio and TV). The project will also help strengthen research ties between the Social Science Academy of China and the Australian Academy of the Humanities. It will also heighten academic interest among ethnic groups: Chinese, Assyrian, Turkish and Iranian in cross-cultural contacts.

**DP1094606** Dr C Lusk; Dr PJ Clarke; Dr P Bellingham

**Approved Project Title** **A framework linking tree species coexistence, zonation and patterns of species richness in forests**

**2010 :** \$ 52,000

**2011 :** \$ 48,000

**2012 :** \$ 47,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** Macquarie University

### Project Summary

Our curiosity-driven proposal capitalizes on a superb opportunity afforded by the occurrence of forest vegetation across a wide range of climates and soils in eastern Australia, an ideal setting for testing ideas about how environment shapes plant evolution as well as forest structure and dynamics. This research will contribute to international interchange of ideas by promoting interaction with collaborators in New Zealand, and will generate a series of publications in high-impact international journals. We will help Australians better understand the forces that shape patterns of woody vegetation across local landscapes, and our carbon-balance framework may shed light on the causes of rarity of some tree species with conservation problems.

**DP1092464** A/Prof AK Mclver; Prof CC Morgan; Prof MJ Butler

**Approved Project Title** **Designing software for secrecy: Security-enabled program algebra**

**2010 :** \$ 60,000

**2011 :** \$ 60,000

**2012 :** \$ 60,000

**Primary RFCD** 2804 COMPUTATION THEORY AND MATHEMATICS

**Administering Organisation** Macquarie University

### Project Summary

Ensuring security and privacy, hard enough for PCs, is a critical problem in computer engineering; the frequency with which software security breaches are reported in smartcards and web applications means that new software-design techniques are urgently needed. This project aims to improve the quality of computer software by creating smart technology which will make it easier for designers to describe and then successfully build-in features that enforce security in software without adverse impact on usability. This research addresses National Security Priority 3, Smart technology, and will build on Australia's world-leading position in pioneering uptake of innovative technology.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094791** Dr BE Medlyn; Dr MR Leishman; Prof S Linder; Dr RJ Norby; Prof R Oren  
**Approved Project Title** **Elevated carbon dioxide (CO<sub>2</sub>) effects on vegetation: repairing the disconnect between experiments and models**  
**2010 :** \$ 120,000  
**2011 :** \$ 115,000  
**2012 :** \$ 100,000  
**Primary RFC** 2799 OTHER BIOLOGICAL SCIENCES  
**Administering Organisation** Macquarie University

### Project Summary

Ecosystem models are important tools used in a variety of applications, including predicting how vegetation uptake of carbon affects global climate, estimating carbon sequestration by natural and planted forests and determining water yield of catchments. Although there has been a massive investment in experiments to determine plant response to elevated carbon dioxide [CO<sub>2</sub>], ecosystem models do not incorporate this body of data as well as they could. This project will use innovative methods to bridge the gap between experimental data and ecosystem models, resulting in significantly improved information for managers of Australia's natural resources into the future.

**DP1093316** Prof PC Menzies  
**Approved Project Title** **Causes that make a difference: A philosophical theory of token-causation**  
**2010 :** \$ 66,000  
**2011 :** \$ 65,000  
**2012 :** \$ 25,000  
**Primary RFC** 4401 PHILOSOPHY  
**Administering Organisation** Macquarie University

### Project Summary

Discussions of causation in philosophy and other disciplines raise matters of practical concern: for example, about how to improve causal explanations in economics, how to devise better ways of testing causal hypotheses in medicine, and how to automate procedures for discovering causal relations in agriculture. By clarifying the structure of causal concepts, the project will help in the efforts to address these problems, and so contribute indirectly to the national benefits that will accrue from solving them. A central aim of the project is to train several PhD students, the next generation of researchers, in this important field of enquiry.

**DP1094624** Prof NH Packer; Prof HK Nevalainen; Prof MD Willcox; Prof NA Jacques  
**Approved Project Title** **Body fluids: sweet protection against infection?**  
**2010 :** \$ 100,000  
**2011 :** \$ 100,000  
**2012 :** \$ 100,000  
**Primary RFC** 2701 BIOCHEMISTRY AND CELL BIOLOGY  
**Administering Organisation** Macquarie University

### Project Summary

Serious health problems caused by pathogenic microorganisms are in sharp increase due to aging population, escalating numbers of immunocompromised people and the increased resistance of microorganisms to currently available antibiotics. Our research will lead to development of new approaches to protect people and animals from pathogens before they invade the body. The commercial possibilities for new and natural antimicrobials are present from both the health and agricultural sectors in Australia and abroad. The technologies used and further developed will serve as a state-of-the-art training ground for the next generation of postgraduate students encompassing the integration of genomics, proteomics and glycomics technologies.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1095465** Prof JA Piper; Dr D Jin; Dr RC Leif; Prof JP Robinson

**Approved Project Title** **Novel coding and decoding in suspension arrays for accelerated biomolecular discovery and personalised medicine**

**2010 :** \$ 132,033  
**2011 :** \$ 118,908  
**2012 :** \$ 84,184

**Primary RFCD** 2999 OTHER ENGINEERING AND TECHNOLOGY

**APD** Dr D Jin

**Administering Organisation** Macquarie University

### Project Summary

This project will establish an advanced multiplexing technique to rapidly analyse complex biological mixtures, such as cell lysates, food samples or body fluids. It will enable the analysis of not tens, but thousands or more distinctive molecular targets in a single test. This will build the foundations for future generation bioassays, paving the way to emerging personalised medicine. This will lead to new personal diagnostics tools for rapid genotype profiling, to better tailor therapy to the individual patient's specific characteristics. As well as the potential to improve health outcomes, the project will generate significant intellectual property and the opportunity for development of new diagnostic instrumentation in Australia.

**DP1095162** Prof RM Rapee; Dr JL Hudson; Prof GS Malhi; A/Prof MP Jones

**Approved Project Title** **Augmentation of fear extinction in anxious children through the use of D-Cycloserine**

**2010 :** \$ 60,000  
**2011 :** \$ 60,000  
**2012 :** \$ 60,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** Macquarie University

### Project Summary

Anxiety disorders affect around a tenth of the population, including children, and produce tremendous personal and social costs. Improving our treatments for anxious children can help to prevent a lifetime of limitations and difficulties. This study will examine whether giving children a small dose of a simple antibiotic can increase the extent to which they lose their fears of specific cues when exposed to those cues. These results have the potential to revolutionise our understanding and treatment of child anxiety.

**DP1095951** Dr PG Sheehan

**Approved Project Title** **Continental Theory in the Wake of Cognitive Literary Studies**

**2010 :** \$ 44,000  
**2011 :** \$ 28,000

**Primary RFCD** 4202 LITERATURE STUDIES

**Administering Organisation** Macquarie University

### Project Summary

In an era that is plainly 'post-theoretical', the recent pioneering attempts to bridge the gap between literary studies and the cognitive neurosciences have far-reaching consequences for the study of English literature. This project will address those consequences by implementing a comparative critical study of continental theory and cognitive poetics, and through this comparison enlarge and refine urgent debates about the future of the humanities and the kinds of teaching practices carried out therein. The project will therefore provide important groundwork for future research carried out at the frontier of literature, critical theory and cognitive science.

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**DP1092835** Prof I Shparlinski  
**Approved Project Title** **Mathematics of Cryptography**  
**2010 :** \$ 80,000  
**2011 :** \$ 80,000  
**2012 :** \$ 80,000  
**Primary RFCD** 2804 COMPUTATION THEORY AND MATHEMATICS  
**Administering Organisation** Macquarie University

### Project Summary

The Australian economy and society requires fast, reliable, and secure communication. Current first-generation security solutions are not capable of supporting the efficiency and scalability requirements of mass-market adoption of wireless and embedded consumer applications. New security infrastructures are emerging and must be carefully, but rapidly, defined. Thus developing new mathematically solid tools in this area is an important and urgent tasks. In addition, the intended work advances our knowledge of the theory and the quality of our culture. As such, it will promote the Australian science and will also have many practical applications in Cryptography, Computer Security and E-Commerce.

**DP1096243** A/Prof T Siu; Prof RJ Elliott  
**Approved Project Title** **Risk Measures and Management in Finance and Actuarial Science Under Regime-Switching Models**  
**2010 :** \$ 65,000  
**2011 :** \$ 65,000  
**2012 :** \$ 65,000  
**Primary RFCD** 2301 MATHEMATICS  
**Administering Organisation** Macquarie University

### Project Summary

New models for assessing and managing risk of financial products will place Australia at the forefront of risk management. The work will also sustain the competitive edge of Australia as one of the major financial centres in the Asia-Pacific region through enhancing both the theory and practice of financial risk management. The project outcome will also benefit to the country in other areas of risk, for example, environment risk, climate change, and energy and security problems.

**DP1092629** A/Prof NH Smith; Dr J Deranty; Dr E Renault; Prof C Dejours  
**Approved Project Title** **Work and self-development: a philosophical reappraisal**  
**2010 :** \$ 86,000  
**2011 :** \$ 83,000  
**2012 :** \$ 91,000  
**Primary RFCD** 4401 PHILOSOPHY  
**Administering Organisation** Macquarie University

### Project Summary

Many Australians are worried about work, perhaps in more complex ways than ever before. Young people entering work lack the orientation once provided by established career paths, mid-life workers are often subject to disorienting shifts in role and difficulties finding the right 'work-life' balance, and many people leaving work find their lives suddenly bereft of meaning. This project will shed light on these anxieties by framing work within an image of the human that does justice to the depth and complexity of contemporary work experience. It promises a deeper understanding of work that would help promote good health and strengthen Australia's social and economic fabric.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1092551** A/Prof RJ Stevenson; Dr TI Case; Dr DM Hodgson; Dr MJ Oaten

**Approved Project Title** **Disgust as a psychosocial defence against infectious disease**

**2010 :** \$ 126,000

**2011 :** \$ 100,000

**2012 :** \$ 96,000

**Primary RFCD** 3801 PSYCHOLOGY

**APD** Dr MJ Oaten

**Administering Organisation** Macquarie University

### Project Summary

Globally, around 1 in 4 deaths result from infectious disease. Humans have evolved two basic means to combat this - an immune system and behaviours to avoid getting sick. This project examines one such behaviour, disgust, and aims to determine its role in disease avoidance. Studying disgust can lead to novel insights into behaviours as diverse as risky sexual decision-making and illness-related stigmatisation (e.g. of people with AIDS or cancer). Disgust can also be used to directly improve human health. For example, it can be exploited to boost hand hygiene. If widely applied, this simple measure could annually save an estimated 1.5 million children's lives, reduce rates of flu, colds, food poisoning and hospital acquired infections.

**DP1094883** Em/Prof RH Street; Prof MS Johnson; Dr SG Lack; A/Prof DR Verity

**Approved Project Title** **Applicable categorical structures**

**2010 :** \$ 100,000

**2011 :** \$ 100,000

**2012 :** \$ 90,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** Macquarie University

### Project Summary

Mathematical research, like other endeavours, operates in specified environments: a space of numbers or vectors, a category of sets perhaps with extra structure, or a category of spaces. Often the environment is a specific category and analysis is internal to that. The novelty of category theory is that it applies also to external relations among the various environments. The direction of our work is motivated by aspects of mathematics, theoretical physics, and computer science. Such work underpins the capacity of the private sector by providing skilled graduates and enhancing the capabilities of the economy. Australia must maintain expertise in basic science and technology to be ready for uncertain future demands.

**DP1096326** A/Prof S Trueck; Prof RC Wolff; Dr R Weron

**Approved Project Title** **Managing the risk of price spikes, dependences and contagion effects in Australian electricity markets**

**2010 :** \$ 49,241

**2011 :** \$ 60,061

**2012 :** \$ 59,834

**Primary RFCD** 3503 BANKING, FINANCE AND INVESTMENT

**Administering Organisation** Macquarie University

### Project Summary

Australian electricity markets are more volatile and spike-prone than other comparable markets. Price spikes account for large parts of total price variation, and companies that are unprepared to manage these risks adequately face potentially substantial losses. The economic reality of price spikes in our interconnected electricity markets which are small and geographically isolated, unlike the proximate markets of Europe and North America, emphasises the imperative of this Australian-focused research. Results will enable forecasting of extreme prices and enable market participants to manage better their risks, in Australia's unique electricity environment, and reduce chances of large losses or default.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094757** Prof V Varadharajan  
**Approved Project Title** **Security for Virtual Machine based Systems**  
**2010 :** \$ 65,000  
**2011 :** \$ 65,000  
**2012 :** \$ 65,000  
**Primary RFCD** 2805 DATA FORMAT  
**Administering Organisation** Macquarie University

### Project Summary

Secure information systems have become paramount importance to our society and economies, which are increasingly based on online services and Internet infrastructures. Trusted interactions are a strategic necessity for businesses, governments and individuals in this ever-increasing digital world. It is critically important for Australia to develop new technologies to anticipate and respond to security threats to its industry and society. The outcomes of this research will result in novel policy based secure and trusted system models and new techniques for malicious attacks detection, which will help to achieve secure Internet applications and large scale systems in Grid computing and e-Science.

**DP1094799** Dr Y Wang; A/Prof MA Orgun; Prof E Lim  
**Approved Project Title** **Trust-Oriented Social Relation Analysis and Social Relation Aware Rating Analysis in Trust Management**  
**2010 :** \$ 60,000  
**2011 :** \$ 60,000  
**2012 :** \$ 60,000  
**Primary RFCD** 2801 INFORMATION SYSTEMS  
**Administering Organisation** Macquarie University

### Project Summary

Trust management is an emerging field offering critical challenges on evaluating the quality and trustworthiness of objects, services and raters. Thus it requires the development of novel techniques and solutions to address these challenges both conceptually and practically. This project will develop innovative techniques to infer trust in complex social networks, detect bias in trust ratings and its dependencies with social relations. They can greatly contribute to breakthrough techniques enabling trust-oriented social network analysis and more objective trust management systems that can be transferred to the Australian IT industry to promote the trustworthiness of Web services and reduce monetary loss.

**DP1093049** Dr KE Westaway; Prof MJ Morwood; Dr GD van den Bergh; Prof G Shen; Dr RM Bailey  
**Approved Project Title** **Unlocking archives of faunal dispersal and extinction: the key to reconstructing palaeoenvironmental change in Southeast Asia**  
**2010 :** \$ 80,000  
**2011 :** \$ 60,000  
**2012 :** \$ 80,000  
**Primary RFCD** 2601 GEOLOGY  
**Administering Organisation** Macquarie University

### Project Summary

The influence of environmental change on faunal populations is a pressing issue for Australian communities in environmentally sensitive areas. This will be addressed by documenting how fauna (and humans) in Southeast Asia, our nearest neighbours, responded to environmental challenges. Revealing when humans dispersed through the region and how they adapted will contribute to our understanding of the cultural heritage of Australia's indigenous settlers. This project will develop established Indonesian collaborations, encourage new collaborations with Chinese, Thai, English and Dutch researchers to promote Australian research on a world stage, and pioneer new dating methodologies to enhance Australia's place at the forefront of geochronology.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094153** Dr X Zhou

**Approved Project Title** **Stochastic Scheduling for Production and Delivery of Perishable Products with Imperfect Information**

**2010 :** \$ 50,000  
**2011 :** \$ 50,000  
**2012 :** \$ 50,000

**Primary RFCD** 2302 STATISTICS

**Administering Organisation** Macquarie University

### **Project Summary**

Australia has a wide range of industries producing perishable goods such as wheat, fruit, vegetables, meat, milk, seafood and health products, as well as fashion and entertainment goods. These industries play a critical role in the Australian economy, as well as impacting on national health and the environment. This project will provide new strategies, models and techniques to increase efficiency in both the production and delivery of perishable products. The outcomes of the project will enable decision makers in industries handling perishable products to optimise the use of resources, reduce costs and waste, raise productivity and improve services. The nation will benefit with higher export income and better quality of consumer products.