

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

## New South Wales

### The University of New South Wales

**DP1095209** Dr K Aguey-Zinsou

**Approved Project Title** **Nano-scale tuning: a path to functional materials for hydrogen storage**

**2010 :** \$ 110,000

**2011 :** \$ 70,000

**2012 :** \$ 80,000

**Primary RFCD** 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

**Administering Organisation** The University of New South Wales

#### Project Summary

If the nano-stores discovered can be taken from bench to markets, the way energy is produced and used will be revolutionised. New markets based on clean energy technologies will appear. The emergence of miniaturised hydrogen stores would create unforeseen markets. By utilising Australia's abundant resources in lithium (Li), magnesium (Mg) and aluminium (Al) to store hydrogen, the beneficiaries would be the Australian industry and academia interested in the knowledge gained and the application of the unique features of nano-hydride materials. By reducing the emissions of greenhouse gases, society would also benefit from a cleaner environment and better health.

**DP1095685** Dr PL Ayres; Prof F Paas

**Approved Project Title** **Learning human motor skills through instructional animations**

**2010 :** \$ 40,000

**2011 :** \$ 50,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

#### Project Summary

The knowledge gained from this research will equip instructional designers and developers with principles for building more effective educational systems. These principles could be widely used in computer-based learning environments and have great commercial potential, as well as providing a well-educated work force. The linking of animated design with developing human motor-skills is highly innovative with clear benefits for the economy. By advancing theories of multimedia E-learning we are ensuring that Australia remains a leader in the field. The outcomes of this study are consistent with Smart information use, because of its potential to lead to smarter and more appropriate use of digital media and technology.

**DP1093045** A/Prof J Bao; Prof BE Ydstie

**Approved Project Title** **Plantwide Control of Modern Chemical Processes from a Network Perspective**

**2010 :** \$ 100,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2906 CHEMICAL ENGINEERING

**Administering Organisation** The University of New South Wales

#### Project Summary

Complex plants increasingly appear in modern Australian process industries, particularly in mineral processing, petrochemical and renewable energies sectors. These plants represent vast capital costs and manufacture products at a very large scale. Improvement in control and operation of these processes can potentially provide significant economic benefits. The expected outcome of this research is an effective approach to improve operational safety, efficiency, product quality and manufacturing flexibility, helping to build a more efficient and environmental conscious Australian chemical industry. This project will also enhance Australia's scientific reputation in the frontier research area of advanced process control and management.

**DP1093842** A/Prof HJ Bateman; Prof JJ Louviere; Dr SJ Thorp; Dr C Ebling; A/Prof T Islam; Prof S Satchell; Prof JF Geweke

**Approved Project Title** **The paradox of choice: Unravelling complex superannuation decisions**

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

2010 : \$ 170,000  
2011 : \$ 210,000  
2012 : \$ 230,000  
2013 : \$ 210,000  
2014 : \$ 140,000

Primary RFCD 3402 APPLIED ECONOMICS

**Administering Organisation** The University of New South Wales

## Project Summary

Australia has been a world-leader in retirement savings policy, but there remains a pervasive lack of understanding about how best to communicate complex financial information to decision-makers, along with a push by government for clearer disclosure and greater financial literacy. This project will inform regulators and the superannuation industry on how choices are made and how to present clearer, better-designed information to be understood by ordinary participants, thus encouraging active, well-informed participation rather than passive 'default' decisions. More efficient investment and benefit choices will improve the economic welfare of retirees, reduce the burden on the working-age population and improve fiscal sustainability.

DP1096268 Dr RA Betz; Dr IF MacGill

**Approved Project Title** Climate change and energy policy: elements of a robust policy mix

2010 : \$ 130,000  
2011 : \$ 80,000  
2012 : \$ 90,000

Primary RFCD 3402 APPLIED ECONOMICS

**Administering Organisation** The University of New South Wales

## Project Summary

The national benefits of the project lie directly in assisting Australia achieve significant emissions reductions (at least 60% by 2050) as part of the global effort to avoid dangerous climate change. This needs to be done in an effective, efficient and equitable manner that takes into account other national policy goals including those of the energy sector. There are clear benefits in developing a framework that can assist in creating a policy mix that explicitly deals with the complementarities and trade-offs that arise in the interaction of the various policy instruments employed to achieve these multiple goals.

DP1094569 Dr KH Black; Prof M Archer

**Approved Project Title** Drying and dying in Australia: extraordinary creatures and climate change 15 million years ago

2010 : \$ 190,000  
2011 : \$ 180,000  
2012 : \$ 180,000

Primary RFCD 2601 GEOLOGY

APD Dr KH Black

**Administering Organisation** The University of New South Wales

## Project Summary

Australia's globally distinctive mammals were confronted 15 million years ago by a climate plunge from lush greenhouse to dry icehouse conditions. In northern Queensland, in the World Heritage-listed cave known as AL90, fossil-rich deposits span this interval of change. Entombed are dozens of extraordinarily well-preserved skulls and articulated skeletons including a growth series from pouch-young to adults of a rare, possibly sloth-like marsupial as well as more familiar kangaroos, thylacines and bats. Our fossil research will help align Australian records of biotic change with global palaeoclimatic events and provide a benchmark for measuring the nature and rate of environmental and biotic change that continues to transform our nation.

DP1094004 Dr R Bonduriansky

**Approved Project Title** The mechanisms and fitness consequences of nongenetic inheritance

2010 : \$ 95,000  
2011 : \$ 100,000  
2012 : \$ 100,000

Primary RFCD 2702 GENETICS

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

**Administering Organisation** The University of New South Wales

## Project Summary

For many decades, it was assumed that parents influence the characteristics of their offspring almost exclusively through the genes that they transmit, and this assumption forms the basis of modern genetics and evolutionary theory. However, it is becoming increasingly clear that parents can also influence their offspring in many other ways, and that such 'nongenetic inheritance' can allow for the transmission of environmental influences across generations. Accumulating evidence suggests that nongenetic inheritance plays a crucial role in heritable diseases, and theory suggests that it can influence evolution. Following up on intriguing preliminary findings, this project will investigate the mechanisms and consequences of nongenetic inheritance.

**DP1096454** Prof MA Bradford; Dr G Ranzi; Dr A Heidarpour

**Approved Project Title** **Unified analysis of steel and composite frame structures subjected to static, thermal, earthquake and blast loading**

**2010 :** \$ 135,000

**2011 :** \$ 155,000

**2012 :** \$ 150,000

**2013 :** \$ 220,000

**2014 :** \$ 90,000

**Primary RFCD** 2908 CIVIL ENGINEERING

APF Prof MA Bradford

**Administering Organisation** The University of New South Wales

## Project Summary

Understanding the science of extreme loading on engineering structures is essential for their design, and increasingly with terrorism threats there is a need for assessment and strengthening of identified vulnerable critical infrastructure. Rational design paradigms have not yet matured for extreme load scenarios, and they are much-needed to protect life, limb and amenity. Australian research is at the forefront in steel and composite structures, and this project will strengthen Australia's positioning in the discipline by developing transparent design and assessment procedures from an efficient algorithm that delivers hands-on guidance for engineering practitioners.

**DP1092465** Prof RC Brooks

**Approved Project Title** **Understanding how reproduction and sexual conflict drive sex-dependent longevity and ageing**

**2010 :** \$ 230,000

**2011 :** \$ 174,000

**2012 :** \$ 174,000

**2013 :** \$ 174,000

**2014 :** \$ 174,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

APF Prof RC Brooks

**Administering Organisation** The University of New South Wales

## Project Summary

The biological study of longevity and ageing has two important fronts: understanding how evolution shapes lifespan and ageing, and the mechanistic study of how molecules, genes, hormones, tissues and cells interact during ageing. The evolutionary study of ageing is considered one of the success stories of the emerging field of evolutionary medicine, yet we desperately need greater integration of the evolutionary and mechanistic spheres. This project addresses why males and females have different lifespans and age differently in a way that bridges evolutionary and mechanistic study, and will build Australia's research capacity to study ageing at both levels.

**DP1094926** Prof R Buckley; Dr H Huang; Prof JJ Norton; Mr DW Arner

**Approved Project Title** **Regulatory responses to the global financial crisis: An Australian perspective**

**2010 :** \$ 50,000

**2011 :** \$ 50,000

**2012 :** \$ 70,000

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

**Administering Organisation** The University of New South Wales

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

## Project Summary

Disclosure underpins all capital markets regulation, but increasing transactional complexity and the way drafting is done reduce disclosure. Plain English Transaction Summaries will greatly assist investors to assess risk accurately and help markets to work. This legislation will enhance our capital markets efficiency and reduce contagion from foreign investments, thereby enhancing the resilience of our financial infrastructure. The second limb will serve to strengthen the financial architecture of our region. It will thus support the Australian economy (given our dependence on exports to the region) and will also promote our understanding of the region.

**DP1095504** Prof R Cavicchioli; Dr F Lauro; Prof M Guilhaus; Dr MJ Raftery; Dr SR Rintoul; Dr MJ Riddle

**Approved Project Title** **Microbial genomics of the southern ocean: monitoring environmental health**

**2010 :** \$ 190,000

**2011 :** \$ 190,000

**2012 :** \$ 190,000

**2013 :** \$ 190,000

**2014 :** \$ 190,000

**Primary RFCD** 2703 MICROBIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

This program will derive an integrated understanding of microbial ecology which is essential for determining ways of preserving the health of the World's ecosystems. Through the development of a unique microbial genomics program, Australia will remain a world leader in Antarctic biology, strengthening Australia's reputation in technologically innovative scientific programs of global significance, training local scientists in cutting edge genomic biology and fostering the interests of the international community in sciences ranging from microbial ecology to climate change.

**DP1095930** Prof V Chen

**Approved Project Title** **Development of High Performance Nanocomposite Filtration Membranes: Fabrication and Fouling Mechanisms**

**2010 :** \$ 115,000

**2011 :** \$ 100,000

**2012 :** \$ 95,000

**Primary RFCD** 2906 CHEMICAL ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

This project will develop high performance membranes for the filtration of water and wastewater using novel nanotechnology processes. This will reduce the costs and environmental impact of water treatment and risk from low-level chemical contaminants such as micropollutants. The project will also provide an enhanced technology base for producing low cost, hybrid inorganic-organic materials for widespread environmental, agricultural and food applications.

**DP1096499** Prof PJ Compton; A/Prof BH Kang; Prof H Motoda

**Approved Project Title** **A more intelligent knowledge-based system apprentice**

**2010 :** \$ 110,000

**2011 :** \$ 100,000

**2012 :** \$ 100,000

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

**Administering Organisation** The University of New South Wales

## Project Summary

Our previous techniques already had an impact on Australian industry, with five Australian companies marketing such technology, and for three of these it is a central technology. We expect an early uptake of the enhancements we propose by these companies, greatly increasing their international competitiveness against other rule technologies. Three of these companies are very recent, so we would expect other company uptake of the new enhanced technology. In turn Australian companies using the technology will improve their competitiveness in an increasingly knowledge-based economy by being able to more rapidly and easily deploy knowledge-based systems. Our previous techniques have already had a significant impact in medical practice.

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**DP1093311** Dr JP Craig

**Approved Project Title** **The time of our lives: Time equity and the balancing of market and non-market production in the modern Australian population**

**2010 :** \$ 130,000

**2011 :** \$ 130,000

**2012 :** \$ 130,000

**2013 :** \$ 119,594

**2014 :** \$ 119,594

**Primary RFCD** 3705 DEMOGRAPHY

QEII Dr JP Craig

**Administering Organisation** The University of New South Wales

## Project Summary

This project will yield new information relevant to the national social inclusion agenda and the research priority goal of understanding and strengthening Australia's social and economic fabric to help families and individuals live healthy, productive, fulfilling lives. Through a multilayered analysis of gender, class, life course stage, time allocation and the connections between them, it will demonstrate links between various forms of social and economic participation and identify how they could be distributed more evenly. This knowledge is important to inform policy to better enable young people to become independent, families to both earn a living and care well for their children, and older people to be productive and socially engaged.

**DP1092640** Prof TP Davis; Dr CA Boyer

**Approved Project Title** **Polymer Stabilized and Bio-functionalised Metal Nanoparticles As Potential Vectors For Drug Therapies**

**2010 :** \$ 130,000

**2011 :** \$ 130,000

**2012 :** \$ 140,000

**Primary RFCD** 2505 MACROMOLECULAR CHEMISTRY

APD Dr CA Boyer

**Administering Organisation** The University of New South Wales

## Project Summary

The project aims to make novel nanoparticles (extremely small, nano means one billionth of a metre) that carry medicines to very specific sites of the body and then release them. This would result in much improved outcomes for conventional chemotherapy but may also allow new gene therapies where diseases can be silenced at their source.

**DP1093163** Prof IW Dawes

**Approved Project Title** **How do cells regulate redox environment at the subcellular level?**

**2010 :** \$ 140,000

**2011 :** \$ 140,000

**2012 :** \$ 140,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Most organisms live in an aerobic environment that subjects their cells to reactive oxygen species. Reactive oxygen species have been proposed to lead to ageing, and in many diseases the balance between oxidising and reducing conditions (the redox environment) is perturbed. This research will identify how different cellular structures sense and maintain this redox homeostasis, not just in the whole cell, but within the different organelles in the cell. The work will help identify which cell compartments and processes are affected in different disease states and provide a fundamental understanding of how cells coordinate their different organelles to maintain the balance between oxidising and reducing conditions.

**DP1094613** A/Prof PH Dawson; A/Prof M Takatsuka; Dr H Yoshikawa; Prof RL Gregory

**Approved Project Title** **Holoshop: The design, implementation and evaluation of rapid 3D drawing technology for content creation in holograms and other three-dimensional displays**

**2010 :** \$ 73,000

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

2011 : \$ 86,000  
2012 : \$ 79,000  
2013 : \$ 118,000  
2014 : \$ 47,000

**Primary RFCD** 4103 CINEMA, ELECTRONIC ARTS AND MULTIMEDIA

**Administering Organisation** The University of New South Wales

## Project Summary

This project, in developing tools and technologies to enable rapid, free-hand, three-dimensional electronic drawing will give a particular visual impetus to the development of display systems technology. It further strengthens Australia's already strong record of applying aesthetic criteria to technological questions and contributing to the international development of virtual media. The resulting intellectual exchanges will raise consciousness of the crucial nature of representation in spatial imaging display. Collaborating with the world class Media Lab (Massachusetts Institute of Technology) as they invent holographic television for the consumer market will give Australia a key role in the experimental design of 3D content creation.

**DP1095395** Prof TM Devinney; A/Prof P Auger; Dr A Gunthorsdottir; Dr RW Belk; Prof J Schwalbach

**Approved Project Title** Understanding civil society activists

2010 : \$ 83,000  
2011 : \$ 127,000  
2012 : \$ 74,000  
2013 : \$ 54,000  
2014 : \$ 50,000

**Primary RFCD** 3502 BUSINESS AND MANAGEMENT

**Administering Organisation** The University of New South Wales

## Project Summary

The growing role and importance of civil society groups demands an understanding of their philosophical and intellectual underpinnings and who the people are that support their agendas. This project provides a multifaceted picture of the supporters of three critical social causes: environmental sustainability, animal welfare and economic globalisation. Understanding who these people are and what motivates them will give us a better understanding of many of the drivers of our own economic and social future, thereby helping to strengthen Australia's social and economic fabric.

**DP1097023** Dr J Dick

**Approved Project Title** Algebraic methods for Markov Chain Monte Carlo and quasi-Monte Carlo

2010 : \$ 180,000  
2011 : \$ 180,000  
2012 : \$ 125,000  
2013 : \$ 125,000  
2014 : \$ 125,000

**Primary RFCD** 2301 MATHEMATICS

QEII Dr J Dick

**Administering Organisation** The University of New South Wales

## Project Summary

In an increasingly complex world, the requirements on computational methods for solving real world problems from areas like statistics, finance, economics, physics and others are also constantly increasing. The results from this project will significantly improve existing computational methods, thereby helping to solve existing computational challenges and further strengthening Australia's reputation as a leading scientific location. The research carried out will be in collaboration with international experts, creating and strengthening existing ties of Australian research institutions with other world class research institutes overseas.

**DP1094183** Dr A Dimoska; Prof S McDonald; Dr O Piguet

**Approved Project Title** Emotion in voice matters: Advancing a neural model of auditory emotion perception

2010 : \$ 61,482  
2011 : \$ 63,119

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

2012 : \$ 64,000  
2013 : \$ 55,611  
Primary RFCD 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Accurate perception of emotion in others is fundamental for positive social relationships, and speaking is the most common source of information from which a person will infer emotional intent. This project capitalises on recent advances in brain imaging technologies to develop a neural theory of vocal emotion perception that integrates research across neuro-cognitive, affective, and language disciplines. This will put Australia at the forefront of an important emerging research field 'social neuroscience', raising our international profile in this area. Findings will provide the theoretical knowledge that is currently lacking in the development of targeted remediation programs for individuals suffering from social communication problems.

**DP1095540** Dr D Dong

**Approved Project Title** **Enhancing Performance in Controlling Finite Level Quantum Systems with Uncertainties**

2010 : \$ 85,000  
2011 : \$ 85,000  
2012 : \$ 80,182  
Primary RFCD 2301 MATHEMATICS  
APD Dr D Dong

**Administering Organisation** The University of New South Wales

## Project Summary

Australia is a recognized leader in the international race to develop quantum frontier technologies. Funding of this project will consolidate and strengthen Australia's leadership in quantum information technology by developing new theory and tractable control approaches to deal with typical uncertainties arising in practical applications and to enhance performance in controlling finite level quantum systems, and will also enhance the capability of Australian researchers to participate in promising quantum technologies. The outcomes of this project will play an important role in establishing Australian quantum information industries, which can provide new commercial opportunities and benefit Australia's economy.

**DP1094119** A/Prof SL Dunwoodie; Dr G Chapman; Dr DB Sparrow

**Approved Project Title** **Defining in molecular terms cis-inhibition as a means to inhibit Notch signaling**

2010 : \$ 130,000  
2011 : \$ 130,000  
2012 : \$ 130,000  
Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Normal development of a baby and our health after birth is dependent on how our cells behave. Signals move between cells and within them to tell them what to do. Proteins interacting with other proteins mostly transmit these signals. This research focuses on a protein named Notch and the signals that it transmits. Notch functions in normal processes, such as blood vessel formation; but abnormal signaling causes and/or contributes to pathological situations such as degenerative disease and cancer. We are working to understand how the Notch signal is made and how to control it when it is abnormal. This will allow new medications to be developed to help people who have cancer and other Notch-related illnesses

**DP1094784** Prof MH England; Dr AS Taschetto; Dr GA Meehl

**Approved Project Title** **Modes of Pacific Ocean variability and their relationship to regional Southern Hemisphere climate**

2010 : \$ 68,000  
2011 : \$ 64,000  
2012 : \$ 66,000  
2013 : \$ 66,237  
Primary RFCD 2606 ATMOSPHERIC SCIENCES  
APD Dr AS Taschetto

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**Administering Organisation** The University of New South Wales

## Project Summary

This project will provide a thorough examination of the role of the major Pacific Ocean modes in forcing variability in Australian climate. Enhancing our knowledge of the mechanisms driving natural modes of variability and how they affect Australian rainfall is fundamental for improving seasonal forecasting and long-term climate prediction. Results from this research can contribute to the underpinning sciences that inform on the risks associated with climate extremes and climate change. This is extremely beneficial to Australia, as it can have implications for adaptation strategies, assisting the socio-economic sectors dependant on climate forecasting, including agriculture, natural resources, bushfire control and water management.

**DP1094338** Dr C Fernandes

**Approved Project Title** **Insurgency and Strategic Non-Violence: The Resistance in East Timor**

**2010 :** \$ 30,000

**2011 :** \$ 30,000

**2012 :** \$ 30,000

**Primary RFCD** 3601 POLITICAL SCIENCE

**Administering Organisation** The University of New South Wales

## Project Summary

The best-known forms of resistance to foreign occupation are violent ones. This project investigates how a largely non-violent insurgency was successful despite being geographically and militarily isolated. It provides important new insights into the research on insurgency and non-violence. It also helps us to better understand East Timor.

**DP1093019** Prof V Flambaum

**Approved Project Title** **Atomic clocks, space-time variation of fundamental constants, violation of fundamental symmetries and tests of unification theories**

**2010 :** \$ 170,000

**2011 :** \$ 170,000

**2012 :** \$ 205,000

**2013 :** \$ 150,000

**2014 :** \$ 100,000

**Primary RFCD** 2403 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PHYSICS

APF Prof V Flambaum

**Administering Organisation** The University of New South Wales

## Project Summary

The project will help to establish Australia among the leaders in important areas of modern science: tests of theories unifying all physical forces and cosmology, search for variation of the fundamental forces of Nature and making super precise atomic clocks. The atomic clocks are used in all navigation (current GPS and future Galileo) systems and many other important applications. The training of students and researchers combined with a rich international collaborative program will insure that Australia is well placed to prepare for the approaching revolution in physics and cosmology.

**DP1093297** Prof JP Forgas; Prof M Brewer

**Approved Project Title** **The social and cognitive functions of affect**

**2010 :** \$ 53,000

**2011 :** \$ 53,000

**2012 :** \$ 53,000

**2013 :** \$ 53,000

**2014 :** \$ 53,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Dealing with affective problems represents a major challenge in clinical, health, organisational and counselling psychology. Yet the role that affective states play in thinking, judgments and many everyday social behaviours remains poorly understood.. This project will produce direct national and community benefit by developing a new,

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integrative theory of affective influences on thinking and action, and exploring the functions and processing consequences of affect in everyday settings. The real-life consequences of affect infusion in applied areas will also be explored. The project will also contribute to Australia's research capability by training doctoral and postdoctoral students, and fostering international research collaboration.

**DP1096019** Prof NR Foster

**Approved Project Title** **Innovative green technology for bio-particle engineering**

**2010 :** \$ 140,000

**2011 :** \$ 135,000

**2012 :** \$ 140,000

**Primary RFCD** 2906 CHEMICAL ENGINEERING

**Administering Organisation** The University of New South Wales

### **Project Summary**

Approximately 40% of new pharmaceuticals are poorly soluble in bodily fluids. In many cases this leads to poor bioavailability, and consequent undesirable side effects as a result of high compensating dosages and generally poor patient compliance. These issues will be addressed by developing a green technology for the re-engineering

of pharmaceuticals with the objective of increasing bioavailability. The research programme falls within the Designated Research Priority of Frontier Technologies for Building and Transforming Australian Industries.

**DP1095108** Dr MA Garratt; A/Prof HR Pota; Prof R Parker

**Approved Project Title** **High-Bandwidth Control and Advanced Dynamic Modelling for Unmanned Helicopters**

**2010 :** \$ 110,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2902 AEROSPACE ENGINEERING

**Administering Organisation** The University of New South Wales

### **Project Summary**

Advanced control theory will be applied to enable precise control of unmanned helicopters in the presence of disturbances. This is critical for: operating unmanned helicopters among the buildings of urban environments, reconnaissance, investigating dangerous areas, pursuit of targets, and many other desirable capabilities for law enforcement and military purposes. The ability of a small RUAV to launch and recover to a moving vessel would significantly enhance operational possibilities for border protection tasks and the Australian Defence Force. The research has direct application to other mechanical systems such as underwater vehicles, mobile robots, and precision control of agricultural vehicles, overhead cranes, and mining equipment.

**DP1095468** A/Prof K Gaus; Dr DM Owen

**Approved Project Title** **Molecular microscopy: protein and membrane dynamics in resting and activated T cells**

**2010 :** \$ 110,000

**2011 :** \$ 110,000

**2012 :** \$ 110,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

APD Dr DM Owen

**Administering Organisation** The University of New South Wales

### **Project Summary**

The aim of this research, to understand the molecular organization and dynamics of the plasma membrane that underlie the signal transduction events, is at the very heart of understanding cell communication. T cell recognition and activation initiates an adaptive immune response to invading pathogens and structurally altered proteins that can be found in cancers. By providing functional insights into the molecular mechanism of T cell activation, we will not only provide fundamental knowledge of receptor signalling but also specific details of T cell receptor triggering that may lead to the development of new therapeutic strategies to control T cell activation.

**DP1092525** Dr AD George Mulgan; Prof M Honma

**Approved Project Title** **Agriculture, politics and trade: Understanding Japan's reform processes and prospects**

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## Project Title

2010 : \$ 40,000

2011 : \$ 39,000

2012 : \$ 39,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Organisation The University of New South Wales

## Project Summary

Japan's continuing agricultural trade liberalisation is essential to Australia's future export prospects in Asia because Japan is Australia's largest export market for agricultural products. By assessing the nature and strength of key domestic factors encouraging reform of Japan's agricultural trade policy, the research will advance knowledge about an area of Japanese political economy that directly affects Australia's trade position and commercial policy. This knowledge will provide intellectual support to the design of current and future Australian multilateral and bilateral trade bargaining strategies at the World Trade Organization and in relation to the Australia-Japan Free Trade Agreement respectively.

DP1096560 Prof RI Gilbert

Approved Project Title **Anchorage of reinforcement in concrete structures subjected to loading and environmental extremes**

2010 : \$ 95,000

2011 : \$ 95,000

2012 : \$ 90,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation The University of New South Wales

## Project Summary

The consequences of collapse of a reinforced concrete building are severe both in terms of cost and human lives. When subjected to extreme events, such as earthquake, blast, accidental impact or other overloads, a concrete structure should deform excessively, but not collapse, i.e. it must be robust. Robustness requires that the steel reinforcement is ductile and that it is adequately anchored in the concrete. When a collapse does occur, it is often due to inadequate anchorage of the steel bars. This project will re-assess the anchorage requirements for reinforcement in concrete structures and provide reliable guidance to the construction industry. The project will lead directly to improvements in the safety and reliability of structures.

DP1092878 Prof GM Goggin; A/Prof MJ McLelland; Dr H Yu; Dr K Lee

Approved Project Title **Internet History in Australia and the Asia-Pacific**

2010 : \$ 205,000

2011 : \$ 145,000

2012 : \$ 155,000

2013 : \$ 125,000

Primary RFCD 4203 CULTURAL STUDIES

APD Dr K Lee

Administering Organisation The University of New South Wales

## Project Summary

Internet History in Australia and the Asia-Pacific will compare the development and uses of the Internet in Australia, with those of China, Korea, and Japan, key trading partners and innovators. This internationally significant project will provide an up-to-date history of the Internet in the world's most dynamic economic region, the Asia-Pacific. Internet infrastructure and technology is critical to Australia's economic, social, and cultural future, and this project aims to provide critical and timely insights to take forward national debate, policy, and practice. Findings will be reported through an innovative website, industry report and workshop, and targeted academic and general publications.

DP1094564 Prof JJ Gooding

Approved Project Title **Making Silicon Even More Useful: Functionalising Silicon to Produce Stable Electronic Devices in Aqueous Environments**

2010 : \$ 210,000

2011 : \$ 230,000

2012 : \$ 260,000

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2013 : \$ 180,000

2014 : \$ 100,000

**Primary RFCD** 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

APF Prof JJ Gooding

**Administering Organisation** The University of New South Wales

## Project Summary

Silicon is the wonder material of our time, being the foundation upon which our electronics and device industries are based. Silicon however would be even more useful if it could be stabilised so the surface did not oxidise in air and water. If this oxidation could be prevented silicon could be used in a whole range of new devices related to biotechnology, molecular electronics and sensing. The project will develop a viable surface chemistry strategy for achieving this stabilisation and hence will greatly expand the scope of devices which can be fabricated from silicon. This will have significant scientific and economic benefits for Australia. We will exploit this new capability for cancer detection, cell engineering and biosensing.

**DP1093380** Dr SS Gray

**Approved Project Title** **Fashion, Identity and the City: Making an 'Australian Style' in fashion, Sydney in the 1970s-80s**

2010 : \$ 91,000

2011 : \$ 90,000

2012 : \$ 80,182

**Primary RFCD** 4104 DESIGN STUDIES

APD Dr SS Gray

**Administering Organisation** The University of New South Wales

## Project Summary

The Australian Textile Clothing and Footwear industry provides over 48,000 jobs and contributes \$2.8 billion to the national economy. Innovation at the 'high end' or 'designer' end of the market is especially important in establishing and maintaining the idea of Australia as an originator of innovative ideas and desirable fashionable style. Insight into how this happens resides within an historical context and cannot be simply conjured up. The project's findings will enhance our understanding of the conditions leading to Australian design and style innovation, contributing to National Priority Three by creating a better understanding of the conditions conducive to innovation.

**DP1093924** Dr EP Greenhalgh

**Approved Project Title** **1918: How the Allies Won the First World War**

2010 : \$ 106,000

2011 : \$ 107,000

2012 : \$ 105,000

2013 : \$ 105,000

2014 : \$ 101,000

**Primary RFCD** 4301 HISTORICAL STUDIES

ARF Dr EP Greenhalgh

**Administering Organisation** The University of New South Wales

## Project Summary

Wars are expensive undertakings, and an understanding of Australia's successful part in the First World War will prove helpful in avoiding expensive mistakes in any future coalition operations to which Australia might contribute. This research will provide a better understanding of Australia's military contribution in 1914-18 by revealing how the international coalition worked. In addition, the success of 1918, in contradistinction to the failed offensive on Gallipoli, should provide lessons for military planners, logistics experts, and civil-military relations generally. The analysis of how wars end will provide especially useful lessons as the messy conflicts in Iraq and Afghanistan follow the Vietnam War into history.

**DP1096211** Ms E Harris; Prof FE Baum; Mr B Harris-Roxas; Dr LA Kemp; Prof JT Spickett; Prof HM Keleher; Prof MF Harris; Prof R Morgan; Dr A Dannenberg; Dr D Sukkumnoed; Mr A Wendel

**Approved Project Title** **The effectiveness of health impact assessments conducted in Australia and New Zealand**

2010 : \$ 100,000

2011 : \$ 90,000

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

**Primary RFCD** 3212 PUBLIC HEALTH AND HEALTH SERVICES

**Administering Organisation** The University of New South Wales

## Project Summary

Health impact assessment (HIA) has been internationally recognised as one of a limited number of preventive interventions that can be used to enhance the health benefits of health and other sector activities - policies, programs and projects - before they are implemented. The issue of how effective HIA is in changing decision-making and implementation remains largely unresolved however. This study will examine the effectiveness HIAs that have been completed in Australia and New Zealand between 2005 and 2009. The findings will guide the use of HIA by the public and private sectors in Australia and internationally, and improve HIA's ability to strengthen Australia's social and economic fabric.

**DP1093197** A/Prof BK Hayes; Prof E Heit

**Approved Project Title** **Unifying models of reasoning and memory**

**2010 :** \$ 80,000

**2011 :** \$ 94,000

**2012 :** \$ 80,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Inductive reasoning involves extending current knowledge to new contexts and is therefore essential for effective learning, decision-making and innovative problem solving. This project extends our understanding of this crucial cognitive skill by developing a new and more comprehensive model of human induction. It also examines patterns of inductive development during the pre-school and primary school years, laying the foundation for the development of better methods for teaching children how to reason.

**DP1094680** A/Prof BI Henry; A/Prof SL Wearne

**Approved Project Title** **New mathematics of fractional diffusion for understanding cognitive impairment at the neuronal level**

**2010 :** \$ 90,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** The University of New South Wales

## Project Summary

As Australia's population ages, cognitive impairment due to cortical ageing and neurodegeneration is looming as the nation's greatest health problem. The project will deliver new, more realistic, mathematical models for a mechanistic understanding of cognitive impairment at the neuronal level. This understanding is a vital first step in targeting drugs, e.g., to influence neuronal spine properties, for preventative health care. The project will maintain international collaborations, between applied mathematicians at UNSW, Sydney and biomathematicians and neuroscientists at Mount Sinai School of Medicine, New York, providing ongoing training opportunities for Australian scientists in this cutting edge biomathematical research.

**DP1093234** Dr JD Henry; Prof WH von Hippel

**Approved Project Title** **Ageing and self-regulation**

**2010 :** \$ 95,000

**2011 :** \$ 85,000

**2012 :** \$ 110,000

**2013 :** \$ 80,000

**2014 :** \$ 60,000

**Primary RFCD** 3801 PSYCHOLOGY

ARF Dr JD Henry

**Administering Organisation** The University of New South Wales

## Project Summary

Australia is faced with an ageing population, and thus an increasingly important national goal is ageing well and

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

ageing productively. Our preliminary research suggests that self-regulation may be a significant problem for older Australians. The proposed research will provide a clearer picture of when and why older adults have difficulties regulating their behaviour, and which older adults are particularly susceptible to lapses in self-control. If older adults do have difficulties self-regulating, and if these self-regulation failures incur health, financial and social costs, by gaining a clearer understanding of this problem, the proposed research will take an important step in improving the lives of older Australians.

**DP1097202** Prof GD Housley

**Approved Project Title** **Physiological significance of transient receptor potential (TRPC3) ion channels in the cochlea**

**2010 :** \$ 100,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 3207 NEUROSCIENCES

**Administering Organisation** The University of New South Wales

### Project Summary

The project seeks to discover the function of transient receptor potential (TRPC3) ion channels in the cochlea. Recent studies have suggested that these proteins, which are expressed by the sensory and neural cells, are key elements regulating sound transduction and neurotransmission. The new knowledge about the physiological processes underlying hearing that this work will provide, will significantly benefit national and international translational research that seeks to develop systems for controlling the sensitivity of our senses, developing biosensors, interacting with neural networks and developing neural prostheses. International collaborators in this project have enabled development of new models, technology and research training opportunities.

**DP1092508** Prof V Jeyakumar; Prof G Lee; Prof B Mordukhovich; Prof S Kim; Dr G Li

**Approved Project Title** **A new improved solution to global optimization over multivariate polynomials: Mathematical principles, numerical methods and selected applications**

**2010 :** \$ 75,137

**2011 :** \$ 75,137

**2012 :** \$ 75,137

**2013 :** \$ 60,137

**Primary RFCD** 2301 MATHEMATICS

**APD** Dr G Li

**Administering Organisation** The University of New South Wales

### Project Summary

Optimization technology is becoming increasingly beneficial to modern Australian society in areas such as wireless communications and manufacturing by improving performance or reducing costs. Our research will produce enhanced global optimization methodologies, capable of solving a wider range of problems that are currently too complex to be solved. Since global optimization technology is used in many scientific disciplines and modern industrial applications, the research will make many Australian science and industries more competitive. Our research also represents a program of high profile international collaborations that will improve Australia's ability to produce internationally competitive optimization technology.

**DP1096353** Prof SK Jha; Prof P Mohapatra

**Approved Project Title** **Multimedia content distribution over multihop broadband wireless networks**

**2010 :** \$ 100,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2801 INFORMATION SYSTEMS

**Administering Organisation** The University of New South Wales

### Project Summary

Multihop Wireless Networks are an ideal medium for Australia where low rural densities require both low set-up costs and environmentally robust infrastructure. Fundamental improvements to multihop wireless protocols will transform their current limited deployment, making them available to more Australians. This project will place Australia in the forefront of wireless network research and can strengthen the competitiveness of the Australian communication industry in the global wireless broadband market.

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

**DP1096900** Dr EL Johnston

**Approved Project Title** **Bioinvasions: the interactive effects of propagule pressure and pollution**

**2010 :** \$ 130,000

**2011 :** \$ 110,000

**2012 :** \$ 120,000

**2013 :** \$ 110,000

**2014 :** \$ 110,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

ARF Dr EL Johnston

**Administering Organisation** The University of New South Wales

## Project Summary

The successful establishment of species outside their native range is an increasingly frequent occurrence and can cause reductions in biodiversity and ecosystem disruption. Bioinvasions may also cause public health risks and damage to agriculture and fisheries. Nowhere is the accelerating pace of bioinvasions more dramatic than in ports and harbours. This project will determine the effects of pollution on invasion in a marine system. This project is in the national interest because it will identify mechanisms through which the invasion of exotic species are encouraged and assist in the identification and prioritisation of effective management strategies to prevent invasion.

**DP1093341** Dr AJ Kearney; Dr JJ Bradley; Dr IJ McNiven; Dr LM Brady

**Approved Project Title** **Seascapes, Sea People, and Indigenous Knowledge: Maritime heritage at the land/sea interface**

**2010 :** \$ 78,000

**2011 :** \$ 48,000

**2012 :** \$ 84,000

**Primary RFCD** 3703 ANTHROPOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

This project will educate the broader Australian community of the complexities of Indigenous maritime heritage, by producing a clear understanding of the ways Indigenous people define and maintain seascapes. This research involves working with the Yanyuwa Aboriginal community to record knowledge of the sea, examining 'new', 'old', gendered, and generational knowledge associated with sea territories. By widely disseminating the results, we will reveal important details of the complexities of sustaining the biodiversity and cultural makeup of Australian seascapes. Furthermore, this Project will provide vital knowledge for the management of coastal regions in an era of predicated sea level rise.

**DP1096480** Prof N Khalili; Dr RK Niven; Dr M Oeser

**Approved Project Title** **CO2 sequestration in deformable, chemically interactive, double porosity media**

**2010 :** \$ 120,000

**2011 :** \$ 120,000

**2012 :** \$ 120,000

**Primary RFCD** 2907 RESOURCES ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Increasing atmospheric carbon dioxide (CO<sub>2</sub>) level is emerging as one of the most serious issues affecting humanity. Models, theories and relationships derived from this research will have a direct and immediate impact on the design, construction, maintenance, management and risk assessment of sequestration systems in Australia and overseas, and will assist Australia and Australian community to meet its target reductions in CO<sub>2</sub> emission. The work will also benefit Australia and the Australian research community through the development of a new expertise in Australia, which will have a significant potential for export to other countries.

**DP1096497** Prof N Khalili; Dr AR Russell

**Approved Project Title** **Erosion of variably saturated soils - a fundamental investigation**

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

2010 : \$ 90,000  
2011 : \$ 90,000  
2012 : \$ 90,000

Primary RFCD 2908 CIVIL ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Soil erosion is a serious problem in Australia and internationally. Each year 75 billion tones of soil are removed due to erosion causing siltation and reduced storage capacity of reservoirs (and in some cases dam failures), while reducing agriculture productivity. Also, the internal erosion of dams has historically resulted in about 1 in 200 dams failing. This project will develop a framework for understanding the initiation, progression and rate of erosion of soils including previously overlooked parameters. It will significantly advance the ability to manage and predict soil erosion. Engineers, land management authorities and dam owners will benefit directly through the development of new experimental and predictive tools.

DP1095077 A/Prof G Kouvaros

**Approved Project Title** Robert Frank: Experimentation Across Film and Photography in Post-War America

2010 : \$ 72,000  
2011 : \$ 64,000  
2012 : \$ 28,000

Primary RFCD 4103 CINEMA, ELECTRONIC ARTS AND MULTIMEDIA

**Administering Organisation** The University of New South Wales

## Project Summary

A study of Frank's career will establish critical models that can be applied to the work of Australian artists and filmmakers – especially those whose personal histories are linked to the waves of immigration that occurred during the '50s and '60s. The publication of a monograph, journal articles, interviews, a DVD and the staging of a retrospective will increase public awareness not only of Frank's work but also the work of those he has influenced. By including an overseas classroom element, this project also provides the opportunity to showcase the quality of Australian film research to high-calibre US students. This is vital to maintaining Australia's international reputation as a provider of film and media research.

DP1095159 A/Prof N Kumar; Prof DS Black; Prof MD Willcox

**Approved Project Title** Disrupting Chemical Communication in Bacteria: A Novel and Effective Antimicrobial Strategy

2010 : \$ 120,000  
2011 : \$ 100,000  
2012 : \$ 100,000

Primary RFCD 2503 ORGANIC CHEMISTRY

**Administering Organisation** The University of New South Wales

## Project Summary

Due to increased application of antibiotics for disease control, many pathogenic bacteria have developed resistance to existing antimicrobials. The infections associated with the resistant bacteria incur a high cost in terms of human health, well being and health care costs. Thus, there is a clear need to develop new antimicrobials that have a novel mechanism of action. The technology proposed here has the potential to deliver enormous health and social welfare benefits to the Australian population as well as commercial benefits to Australian industry, through provision of new, locally produced technologies for the control of bacterial virulence.

DP1096769 Dr SS Li; Prof E Wang; Dr M Ionescu

**Approved Project Title** Materials Optimization and Interfacial Engineering of Cobalt and Europium Codoped ZnO for Multifunctional Spintronic Devices

2010 : \$ 110,000  
2011 : \$ 110,000  
2012 : \$ 120,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

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

Recent advances in new materials engineering holds a promise of surmounting the miniaturization limits of silicon technology by exploiting the spin of electrons in semiconductors. Spin transistor is among a number of nanoscale devices that may revolutionize telecommunications, computing and daily life. Current transistors are electronic circuits that make up most semiconductors; an international market will grow to US\$1000bn per year in 2013. In

a few years, the spin transistor will be on par with electronics. Success of this program will facilitate the development of spintronic materials and technologies, and also generated patents and intellectual properties, thus resulting in revenue for Australia through their commercialisations.

**DP1096437** Prof PF Lovibond; Dr G Weidemann

**Approved Project Title** **Testing the multiple learning system model with eyeblink conditioning in normal and amnesic participants**

**2010 :** \$ 75,072

**2011 :** \$ 52,832

**2012 :** \$ 72,352

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

This project will test whether learning of new material always requires active attention and effort, or whether some types of learning can occur automatically. We will use a laboratory task, eye blink conditioning, that has been claimed to occur automatically. The results will guide neuroscientists in their search for the brain mechanisms of learning and memory. They will also help to optimise strategies for education, training and clinical treatments where new material must be communicated as effectively as possible.

**DP1096668** Prof RP Mattick; Prof JM Najman; Dr K Kypri; Dr TN Slade; Dr LE Vogl; Dr D Hutchinson

**Approved Project Title** **Can parents teach their children to drink alcohol responsibly? Or, is one drop a drop too many?**

**2010 :** \$ 170,000

**2011 :** \$ 175,000

**2012 :** \$ 175,000

**2013 :** \$ 120,000

**2014 :** \$ 120,000

**Primary RFCD** 3212 PUBLIC HEALTH AND HEALTH SERVICES

**Administering Organisation** The University of New South Wales

## Project Summary

Parents typically supply alcohol to their children believing it is the best way to teach responsible drinking. Whether parents should provide alcohol is controversial and the evidence to inform this decision is unclear. This research will provide an in-depth understanding of the consequences of parents providing alcohol to their children and when, where and how this can be done to minimise harm. This is a national priority as alcohol abuse is a leading cause of injury and death among young Australians and developing the knowledge for preventive health care is essential. This research will provide parents with the information they need to give their children a healthier start to life.

**DP1097010** Dr CJ Mitchell; Prof PF Lovibond

**Approved Project Title** **Associability processes in propositional learning**

**2010 :** \$ 90,000

**2011 :** \$ 93,000

**2012 :** \$ 95,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

A novel attentional model of learning is evaluated in this project. In this model, learning is seen not as a consequence of a low-level, evolutionarily old system shared with our ancestors, but as a product of our capacity to apply rules and engage in reasoning. Understanding the role of attention in learning will allow a better understanding of the attentional biases seen in clinical disorders such as addiction and a new way to think about the neuroscience of attention. These benefits may further suggest new lines of research in the development of drugs to combat attentional disorders.

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

**DP1094880** Prof O Ostrovski; Dr G Zhang; Dr S Jahanshahi

**Approved Project Title** **A Novel Approach to Processing of Australian Laterite Ores through Selective Reduction and Carbonylation**

**2010 :** \$ 120,000

**2011 :** \$ 110,000

**2012 :** \$ 120,000

**Primary RFCD** 2913 METALLURGY

**Administering Organisation** The University of New South Wales

## Project Summary

Processing of laterite ores, started in 1998 in Australia, has significantly enhanced Australian role on the international nickel market. However, the production of nickel from oxide ores by established technologies consumes two to three times energy as processing of sulphide ores with significant environmental impact. This underlines the importance of development of more energy efficient processes for oxide ores. The proposed technology will significantly decrease energy and water consumption, and greenhouse gas emissions in nickel production. It will enhance the competitiveness of Australian Nickel Industry and stimulate its expansion with significant economy and social benefits.

**DP1096099** Dr Y Otsuka; Dr B Spehar; Prof MK Yamaguchi

**Approved Project Title** **Missing the big picture: Global form perception from infancy to adolescence**

**2010 :** \$ 84,575

**2011 :** \$ 87,025

**2012 :** \$ 83,882

**Primary RFCD** 3801 PSYCHOLOGY

APD Dr Y Otsuka

**Administering Organisation** The University of New South Wales

## Project Summary

There is hardly another system, either biological or artificial, that surpasses the visual system in its ability to process extremely complex and dynamic information. The questions concerning developmental aspects of this ability have been one of the most fascinating in both philosophical and scientific inquiry. This research will provide insights of theoretical significance to the perceptual bases of cognitive development. The research proposed will enhance international collaboration and strengthen Australia's strong reputation in vision research. It also contributes to national research training by offering honours and PhD students research training and international exposure.

**DP1093363** A/Prof GD Otto; Dr GM Voss

**Approved Project Title** **Evaluation of targeting rules for implementing monetary policy**

**2010 :** \$ 50,000

**2011 :** \$ 20,000

**2012 :** \$ 20,000

**Primary RFCD** 3402 APPLIED ECONOMICS

**Administering Organisation** The University of New South Wales

## Project Summary

Monetary policy plays a primary role in stabilising business cycle fluctuations and in mitigating the effects of large economic shocks. This research deals with key issues in the operation of monetary policy. Our econometric analysis will provide new evidence on the short term goals pursued by central banks and improve our understanding their trade-offs. One application of our results will be an improvement in the ability to measure and evaluate the performance of central banks. Greater evidence on the objectives and constraints of central banks will increase public knowledge and understanding of monetary policy, leading to more effective policy.

**DP1095722** Dr G Peters; Dr WL Peirson; Prof NJ Ashbolt

**Approved Project Title** **Interdisciplinary greenhouse gas assessment - nitrous oxide emissions from marine wastewater disposal**

**2010 :** \$ 110,000

**2011 :** \$ 100,000

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

**2012 :** \$ 110,000  
**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Data generated during this research will resolve ongoing uncertainties surrounding a blind spot in national greenhouse gas (GHG) abatement policy and methodology. Current national and international GHG emission estimates are unable to account for N<sub>2</sub>O emissions resulting from the downstream disposal phase of the wastewater management cycle, and as a result, actual GHG emissions may be far greater than currently estimated. This research will provide primary data on the magnitude of downstream N<sub>2</sub>O emissions coming from the near-shore marine disposal of primary-level municipal wastewater in Australia. Results from this research will help quantify the carbon footprint associated with marine disposal of poorly treated effluents worldwide.

**DP1094650** Prof IR Petersen; A/Prof EH Huntington; A/Prof CC Harb

**Approved Project Title** **New quantum and robust control theory with applications to quantum optics**

**2010 :** \$ 245,000

**2011 :** \$ 220,000

**2012 :** \$ 260,000

**2013 :** \$ 180,000

**2014 :** \$ 100,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** The University of New South Wales

## Project Summary

The application of quantum mechanics to the creation of quantum technology promises to be one of the most exciting technological developments of this century. Possible applications of quantum technologies include vastly improved sensors to search for minerals or gravity waves, secure quantum cryptography, and quantum computing. Quantum feedback control is a key tool in quantum technology. This project will lay the foundations of

systematic theories of robust, coherent and nonlinear quantum feedback control and lead to advances in the control of highly resonant systems which underlie experimental quantum and nano technology. This will enable Australia to reap great benefits as this new technological area emerges.

**DP1097096** Dr Y Pi

**Approved Project Title** **Interval nonlinear analysis of spatially curved structures with material and geometric uncertainties.**

**2010 :** \$ 50,000

**2011 :** \$ 40,000

**2012 :** \$ 40,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Understanding the implications of uncertainties on the nonlinear behaviour of curved structures that are sensitive to property variations helps the accurate safety assessment and design of curved structures in Australia. The innovative interval approach will be applied specifically to the important class of curved structures, the efficient and reliable construction of which promises great advantages for the Australian construction industry. The project will lead to novel outcomes that will keep Australian research at the forefront of the discipline for many years, and so maintaining its internationally recognised outstanding reputation in the research of curved structures and nonlinear structural mechanics.

**DP1093279** Dr O Piguet; Prof JR Hodges; Dr M Hornberger

**Approved Project Title** **Prefrontal and medial temporal lobe cortices' interactions to episodic long-term memory**

**2010 :** \$ 130,000

**2011 :** \$ 100,000

**2012 :** \$ 97,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

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

## Project Summary

Current models of episodic memory in humans are incomplete. They mostly consider only one of the two brain systems known to be critical to this cognitive ability. This project will propose the first comprehensive model of episodic memory and, in doing so, will advance our knowledge of human memory systems and will maintain Australian research competitiveness in a domain that is fast evolving. This research contributes to ageing well, ageing productively. Because memory deficits are becoming increasingly common in our ageing population and may represent a sign of dementia, accurate evaluation of episodic memory integrity is essential.

**DP1094023** Dr SL Restubog; Dr S Chan-Serafin; Dr HT Bainbridge

**Approved Project Title** **The high cost of bad bosses: Reactions of employees, co-workers, and employees' partners to abusive supervision**

**2010 :** \$ 70,000

**2011 :** \$ 65,000

**2012 :** \$ 65,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Abusive supervision has serious consequences for individuals and organisations. It is detrimental to employee well-being, reduces productivity, and may even result in litigation. We examine the negative effects of abusive supervision not only on employees but also on those around them: their co-workers and families. Our proposed intervention is a major step towards empowering employees to effectively manage the aftermath of supervisory mistreatment. The outcomes of this research will demonstrate the need for organisations and governmental agencies to invest more resources in the prevention of these harmful supervisory practices.

**DP1093333** Dr J Richmond

**Approved Project Title** **Uncovering the mechanisms of early memory development: A new approach using eye tracking**

**2010 :** \$ 50,000

**2011 :** \$ 40,000

**2012 :** \$ 50,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

This research represents a theoretical and methodological advance in developmental science. In combining behavioural measures of infant memory with novel eye-tracking methods and electrophysiology, this research will significantly advance our knowledge about the nature of infant memory representation and our understanding of the mechanisms of early memory development. The research will further solidify Australia's reputation as an innovative leader in the rapidly growing field of developmental cognitive neuroscience. Third, the interdisciplinary nature of this project will provide internationally-competitive research training opportunities for Australian students.

**DP1093982** Prof C Rizos

**Approved Project Title** **Preparing for the next generation global navigation satellite system era: developing and testing new user and reference station receiver designs**

**2010 :** \$ 100,000

**2011 :** \$ 100,000

**2012 :** \$ 100,000

**Primary RFCD** 2910 GEOMATIC ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

The gross accumulated benefits of the widespread adoption of Gnss technology in the mining, agriculture and construction sectors alone by 2030 could be between \$66B and \$126B, primarily due to improvements in Gnss machine guidance systems - energy savings, reduction in carbon dioxide emissions, improved agricultural practices, etc. The national benefit would be enormous if the project could help facilitate the rapid and orderly introduction into Australia of high accuracy multi-constellation Gnss positioning technology. This project would also enable Australian researchers and industry to build up expertise in new Gnss signals and techniques, all crucial for supporting a local industry for next generation navigation products and services.

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

**DP1096181** Prof JH Roberts; Prof PD Morrison

**Approved Project Title** **Developing demand-side strategies for sustainable futures at the business and consumer levels**

**2010 :** \$ 150,000

**2011 :** \$ 180,000

**2012 :** \$ 150,000

**2013 :** \$ 60,000

**Primary RFCD** 3502 BUSINESS AND MANAGEMENT

**Administering Organisation** The University of New South Wales

## Project Summary

Australia is facing a world in which the material demands of developing nations are putting pressure on global resources, at the same time as effects of economic activity on the earth's climate are leading to questions about the planet's sustainability. Efforts to mandate changes in consumption patterns are likely to be politically unpopular and lead to a loss of social welfare. This research will investigate ways in which choices between current and future consumption can be framed to maximize voluntary consumer choices for sustainable futures. It will allow the demand side of negative environmental trends to be addressed, reducing the pressure on the supply side without the loss of consumer sovereignty.

**DP1095046** Prof V Sahajwalla; Dr R Khanna; Prof S Seetharaman

**Approved Project Title** **Novel Atomic Level Investigations of High Temperature Surface Thermodynamics of molten steel**

**2010 :** \$ 80,000

**2011 :** \$ 80,000

**2012 :** \$ 80,000

**Primary RFCD** 2913 METALLURGY

**Administering Organisation** The University of New South Wales

## Project Summary

This project will develop a highly advanced research capability to investigate critical aspects of impurity interactions and surface phenomena in molten steel. Innovative research proposed in this project will pave the way towards developing novel atomic level technologies whose potentials are largely unexplored and untested, with profound implications for international standing of Australian science and steel industry. It will lay the foundations for improvements in steelmaking practices enhancing operational efficiency, environmental sustainability with immense economic/technological benefits. Significant savings are to be gained from the ability to process lower cost scrap and reducing contamination in the final steel products.

**DP1094998** Dr E Schubert; Dr DA Cabrera; Prof GE McPherson

**Approved Project Title** **Redefining conceptions of child and adolescent emotional responses to music using time-series analysis**

**2010 :** \$ 80,000

**2011 :** \$ 85,000

**2012 :** \$ 100,000

**2013 :** \$ 20,000

**Primary RFCD** 4101 PERFORMING ARTS

**Administering Organisation** The University of New South Wales

## Project Summary

The National Review of Music Education recognizes the need to understand more fully how musical experiences impact on children's emotional and general development. Australian researchers are leaders in the field of continuous response to emotion in music. Our international leadership on this critically important issue will result in new ways of understanding music and teaching music to children through to adults because our explanations of affective aspects of music will be framed within a scientific perspective which moves beyond learning the purely technical and subjective aspects of music appreciation.

**DP1093343** A/Prof PB Setterlund

**Approved Project Title** **Controlled/living radical polymerization in environmentally friendly miniemulsions induced by compressed carbon dioxide for synthesis of nanoparticles and well-defined polymer**

**2010 :** \$ 110,000

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

2011 : \$ 93,955  
2012 : \$ 95,000  
Primary RFCD 2505 MACROMOLECULAR CHEMISTRY

**Administering Organisation** The University of New South Wales

## Project Summary

Controlled/living radical polymerization is a technique for precise synthesis of polymer by radical polymerization, which has revolutionized polymer synthesis in terms of accessible polymer structures. However, controlled/living radical polymerization has yet to gain a strong foothold in industry mainly due to problems associated with its implementation in (aqueous) dispersed systems. The present Proposal addresses this key challenge by a novel environmentally friendly and versatile method for aqueous miniemulsion preparation by use of compressed carbon dioxide. Controlled/living radical polymerization in dispersed systems generates polymeric nanoparticles, which are of importance in many advanced and emerging technologies.

**DP1096144** Dr WP Sijp

**Approved Project Title** **The equable climate conundrum: the role of the global ocean in multiple climate regimes**

2010 : \$ 104,566  
2011 : \$ 105,566  
2012 : \$ 104,566  
2013 : \$ 105,566  
2014 : \$ 104,566

Primary RFCD 2606 ATMOSPHERIC SCIENCES

ARF Dr WP Sijp

**Administering Organisation** The University of New South Wales

## Project Summary

This study will enhance Australia's global engagement in the research of past climates and global warming, and lead to a better understanding of the dynamics and modelling of warm climate states. This will contribute significantly to climate research in Australia and could lead to a better knowledge of the formation of the ancient deposits that we mine today. Furthermore, the study of past warm climates tells us something about current global warming, as both involve increased levels of carbon in the atmosphere. The impact of climate change on Australia is likely to be large. This study of past warm climates will improve our understanding of climate change physics and help quantify the risks of climate change posed to Australia.

**DP1097185** Prof MY Simmons; Dr WR Clarke

**Approved Project Title** **Redesigning the transistor at the atomic-scale**

2010 : \$ 210,000  
2011 : \$ 195,000  
2012 : \$ 225,000  
2013 : \$ 150,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

APD Dr WR Clarke

**Administering Organisation** The University of New South Wales

## Project Summary

Australian researchers have a world-wide leadership position in atomic-scale electronics. Through the development of powerful new fabrication technologies, Australian scientists are now poised to uncover the physical properties of electronic systems operating on the atomic-scale. This research will be internationally significant, providing ongoing international profile for Australian science. Perhaps more significantly, it will also lay the groundwork for future miniaturisation - and redesign - of the conventional transistor. Over the longer-term, it offers an opportunity for Australia to lift its involvement in the multi-trillion dollar global semiconductor industry.

**DP1092805** Dr SA Sisson

**Approved Project Title** **Innovations in Bayesian likelihood-free inference**

2010 : \$ 84,000  
2011 : \$ 86,000  
2012 : \$ 90,000  
2013 : \$ 84,000

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**2014 :** \$ 70,000  
**Primary RFCD** 2302 STATISTICS  
QEII Dr SA Sisson

**Administering Organisation** The University of New South Wales

## Project Summary

Bayesian inference is a statistical method of choice in applied science. This project will develop innovative tools which permit Bayesian inference in problems considered intractable only a few years ago. These methods will expedite advances in multidisciplinary research across a range of applications. With these foundations, this project will accelerate national research efforts into improving frameworks for projecting trends in water availability and management, the impact of climate extremes, telecommunications engineering, HIV and infectious disease modelling and biostatistics. With many sectors unable to recruit appropriately trained statisticians within Australia, this project will train four PhD students in Bayesian statistics.

**DP1095299** A/Prof JR Smith; Prof JA Wolfe

**Approved Project Title** **Beyond linear source-filter theory: how does the vocal tract affect the motion of the vocal folds?**

**2010 :** \$ 100,000

**2011 :** \$ 88,000

**2012 :** \$ 88,000

**Primary RFCD** 3206 MEDICAL PHYSIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

The human voice lies at the very core of human culture. Yet the way in which the vocal folds ('vocal cords') vibrate is only partly understood and the way in which sound waves within the vocal tract affect this vibration is almost unknown, beyond the fact that it is sometimes important. Using new and unique non-invasive techniques, we shall conduct acoustic experiments to measure properties of the vocal folds and their interaction with the sound they produce in the vocal tract. This knowledge will solve some of the remaining puzzles about the voice. Practical applications will include exercises in voice control (especially for singers and orators) and potential applications in clinical diagnosis techniques.

**DP1094451** A/Prof C Song; Dr W Gao; Prof W Becker

**Approved Project Title** **Non-deterministic fracture analysis of structures by extending the scaled boundary finite-element method**

**2010 :** \$ 130,000

**2011 :** \$ 140,000

**2012 :** \$ 150,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

A very large part of Australia's dam, bridge and building infrastructure is ageing and experiencing cracking and deteriorations in material properties caused by progressive deterioration of concrete and corrosion of steel. This research addresses the practical and challenging problems of cracked structures with uncertainties in their properties and crack sizes. The advanced numerical tool developed as an outcome of this project will enable engineers to evaluate the reliability of structures under various scenarios of cracking, variation in material properties, rehabilitation and loading. The acquired knowledge will lead to more rational decisions in safe and cost-effective management of our ageing infrastructure.

**DP1096464** Prof PD Steinberg; Prof SL Kjelleberg; Dr T Thomas; Dr SG Egan; Dr MA Coleman

**Approved Project Title** **Stress, virulence and bacterial disease in temperate seaweeds: the rise of the microbes.**

**2010 :** \$ 140,000

**2011 :** \$ 120,000

**2012 :** \$ 120,000

**2013 :** \$ 120,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** The University of New South Wales

## Project Summary

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

Climate change is predicted to increase the spread and virulence of pathogens, and decrease the resistance to disease via temperature stress on the hosts. Combined with other human impacts (higher nutrients, pollution), we may be facing a major rise in the effect of disease on natural communities. However, these effects are largely unstudied. We will investigate the impact of marine pathogens on kelps and other seaweeds when they are stressed by temperature, elevated nutrients or other anthropogenic stressors. Kelp are the 'trees of the oceans', the organisms responsible for creating much of the habitat that fishes and other organisms live in. The loss of kelp forests due to disease would radically change these environments.

**DP1096481** Prof PD Steinberg; Prof SL Kjelleberg; Dr D McDougald; Dr T Harder; Dr CA Motti

**Approved Project Title** **Chemical warfare at small scales: does eukaryotic chemical defense theory fit biofilms?**

**2010 :** \$ 110,000

**2011 :** \$ 100,000

**2012 :** \$ 100,000

**Primary RFCD** 2703 MICROBIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

The ecology of bacteria has long been treated separately from the ecology of higher organisms. Thus we do not know whether the ecology of bacteria operates by the same general rules as those of plants and animals. This significantly diminishes our understanding of the natural world, and our capacity to manage our environment. In this project we will systematically test ecological defense theories in bacterial systems. Our aim is to merge our understanding of the ecology of these very different organisms. This integration of plant and animal ecology and environmental microbiology is new for both fields, and thus studies such as this one have the potential to put Australia at the forefront of this exciting new approach to our environment.

**DP1092661** A/Prof M Stenzel; Dr G Chen; Dr DL Morris; Dr MH Pourgholami

**Approved Project Title** **Core-shell nanoparticle from polymers with pendant cyclodextrins**

**2010 :** \$ 140,000

**2011 :** \$ 120,000

**2012 :** \$ 110,000

**Primary RFCD** 2505 MACROMOLECULAR CHEMISTRY  
APD Dr G Chen

**Administering Organisation** The University of New South Wales

## Project Summary

A better drug delivery system will be developed for the treatment of cancer with albendazole. These nanoparticles enhance the circulation time in the body, but also facilitate the delivery of the drug to the site of the tumour, which will increase the efficacy of the treatment. The nanoparticles are obtained by processing polymers with pendant cyclodextrin groups, which are a type of complex sugars. Aim of this work is the exploration of synthetic routes to generate nanoparticles. Tailoring the underpinning polymer structure of these nanoparticles will allow the optimisation of the release of albendazole from the drug carrier, thus improving cancer treatment.

**DP1092694** A/Prof M Stenzel

**Approved Project Title** **Triggering the release of polymer bound platinum drugs**

**2010 :** \$ 110,000

**2011 :** \$ 110,000

**2012 :** \$ 110,000

**Primary RFCD** 2505 MACROMOLECULAR CHEMISTRY

**Administering Organisation** The University of New South Wales

## Project Summary

Platinum drugs are found to be highly efficient as anti-cancer drugs. Their side-effects however, limit their application. Nanoparticles are developed that bind the platinum drug tightly as long as the drug circulates in the blood stream, but releases the drug as soon as it reaches the tumour. To treat prostate cancer, the nanoparticle will be attached to a targeting moiety - a monoclonal antibody - that facilitates the effective delivery to the prostate cancer cells, but leaves healthy cells unaffected. This proposal aims to develop suitable synthetic pathway to enhance the treatment of cancer by using appropriate delivery vehicles.

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

**DP1093649** Dr D Stock

**Approved Project Title** **Structure and temperature adaptation of chaperonin TF55 from Sulfolobus solfataricus**

**2010 :** \$ 120,000

**2011 :** \$ 100,000

**2012 :** \$ 110,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Our work has future potential both for biotechnology and for medical therapies. The cages formed by chaperonin subunits and their ability to bind to specific targets could lead to their application as nano-vesicles, could facilitate expression of eukaryotic proteins in bacteria and could help to prevent or dissolve protein aggregates. With Australia's ageing population, we can expect an increasing prevalence of pathologies such as Alzheimer's and Parkinson's disease and other diseases that arise from protein mis-folding and aggregation, including myopathies and cataracts. A participation of chaperonins has been implicated in these age-related diseases and demands detailed structural and functional investigations.

**DP1096691** Prof RM Stuetz; Dr KR Murphy; Prof R Bro

**Approved Project Title** **Olfactory Characterisation of Odours for Optimising Impact Assessment**

**2010 :** \$ 120,000

**2011 :** \$ 110,000

**2012 :** \$ 100,000

**Primary RFCD** 2911 ENVIRONMENTAL ENGINEERING

APD Dr KR Murphy

**Administering Organisation** The University of New South Wales

## Project Summary

The repeated release of obnoxious odours from intensive livestock, waste management and wastewater treatment facilities can constitute a major air quality problem for a local population. Odour management has traditionally been maintained by the use of buffer distances that have significantly decreased with urban encroachment. Odour assessment is conventionally measured in terms of odour concentration; however this standardised method does not take into account odour quality characters or their intensity. The project will characterise by sensory means the odour nuisance types and intensity of different odorous emissions to better define and understand the relationship between process operations and olfactory annoyance.

**DP1097133** Prof PL Swan

**Approved Project Title** **Chief executive officer pay, incentives, talent and risk-taking: Excessive pay, regulation and the global financial crisis**

**2010 :** \$ 130,000

**2011 :** \$ 132,000

**2012 :** \$ 134,000

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

**Administering Organisation** The University of New South Wales

## Project Summary

The Prime Minister has requested the regulators, APRA and Treasury, to come up with rules that would prevent a repeat of the trillion dollar bailouts and guarantees to the financial sector and banks at risk of failure. Excessive pay and risk-taking by bank executives shoulder made the blame for the global crisis that has already cost Australian investors and taxpayers a sizeable portion of the nation's wealth. The project will greatly assist the regulators in this task. It will also identify compensation practices that reward good long-term performance without excessive pay. This could dramatically raise the performance of Australian companies and ameliorate the problem of dissatisfied investors and taxpayers.

**DP1093772** Prof M Taft

**Approved Project Title** **How we read words: From the letters on the page to the words in our head**

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

2010 : \$ 87,000  
2011 : \$ 91,000  
2012 : \$ 96,000  
Primary RFCD 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

By attempting to advance our understanding of how adult readers decode visually presented words, this project has the potential to inform reading improvement programs for secondary and tertiary students. In addition, implications emerge for the training of reading acquisition, with the research describing the ultimate goal for the beginning reader. It is clearly important for Australia to optimise the reading skills of its adult population, and the aim of the project is to establish the cognitive mechanisms required for such optimisation. Furthermore the theoretical insights provided by the research will help maintain Australia's strong presence and reputation in the area of reading research.

DP1096665 Prof DS Taubman

**Approved Project Title** **Non-Parametric Modelling of Motion and Depth fields with Boundary Geometry for Scalable Compression and Dissemination**

2010 : \$ 126,000  
2011 : \$ 125,000  
2012 : \$ 125,000  
Primary RFCD 2805 DATA FORMAT

**Administering Organisation** The University of New South Wales

## Project Summary

Applications for large format video surveillance are about to grow rapidly, starting with military applications and then moving into the civilian arena, highlighting the importance of compression for interactive dissemination, so as to make best use of limited communication channels. This project will develop an innovative representation for motion and depth/elevation maps, which addresses a key obstacle in the deployment of technology for efficient interactive access to large format video and geospatial imagery. These applications are relevant to Australia's defence and infrastructure for smart information use. Moreover, this is a strategic proposal to strengthen Australia's existing lead in aspects of interactive media dissemination.

DP1097149 Dr W Teoh; Dr MS Lord; Dr C Gunawan

**Approved Project Title** **Advanced nanoparticles as biocompatible antioxidant agents with targeting functionality**

2010 : \$ 149,000  
2011 : \$ 128,000  
2012 : \$ 117,000  
Primary RFCD 2914 MATERIALS ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

This proposal addresses the core issue of designing nanoparticles capable of delivering antioxidant properties in a biological environment. The major benefits to Australia are two-fold: first will be in the improved health outcomes by providing materials that are better suited to targeted therapeutic delivery, thereby improving the quality of life and reducing the need for further surgical intervention; the second is in providing greater knowledge about nanoparticle interactions with the biological environment. This project will assist in the training of researchers in this field which will in turn provide economic growth through the development of Australian industries.

DP1092889 Dr LM Trahair; Dr RS Sinnerbrink; Asst Prof GM Flaxman

**Approved Project Title** **Film as Philosophy: Understanding Cinematic Thinking**

2010 : \$ 57,000  
2011 : \$ 36,000  
2012 : \$ 26,000  
2013 : \$ 28,000  
Primary RFCD 4203 CULTURAL STUDIES

**Administering Organisation** The University of New South Wales

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

## Project Summary

The project benefits Australia by initiating collaboration between the disciplines of film and philosophy, establishing a network of scholars of international renown and a forum for their interaction to steer the future development of a significant field of contemporary interdisciplinary investigation. It will augment Australia's international standing in continental philosophy and serve the community by opening up a new research area that stands to integrate film studies within the core of humanities education in tertiary institutions. This will ensure the ongoing relevance of philosophical and aesthetic research to contemporary cultural formations and stimulate ethical debates about culture and the mass media in the broader community.

**DP1096704** Dr A Uddin; Prof MA Green; Dr GJ Conibeer; Dr D König

**Approved Project Title** **Towards a ten percent efficient organic solar cell**

**2010 :** \$ 115,000

**2011 :** \$ 120,000

**2012 :** \$ 100,000

**Primary RFCD** 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Organic photovoltaic (OPV) cells have the potential to reduce costs of electricity production significantly below those using traditional solar cells. Successful development of a 10% efficient organic solar cell of improved durability would not only increase the use of this environmentally sustainable energy source but also increase Australian manufacturing opportunities. Solar photovoltaics has been identified as one of the most desirable future energy options with the potential to displace fossil fuels and result in better utilisation of hydroelectricity resources. However, significant cost reduction as targeted by this project is required to exploit the full potential of this environmentally benign technology.

**DP1096669** Dr N Valanoor; Prof PR Munroe; Dr S Kalinin; A/Prof I Takeuchi

**Approved Project Title** **Elastically controlled magnetoelectric transduction in thin film multilayers.**

**2010 :** \$ 100,000

**2011 :** \$ 110,000

**2012 :** \$ 100,000

**2013 :** \$ 80,000

**2014 :** \$ 70,000

**Primary RFCD** 2914 MATERIALS ENGINEERING

**ARF** Dr N Valanoor

**Administering Organisation** The University of New South Wales

## Project Summary

Ferroelectric and ferromagnetic materials have attracted significant attention and exhibited potential in many applications such as storage memories, solid-state light sources and a range of smart chemical and biological sensors. This proposal seeks to investigate the behaviour of these materials in layered form, where an imposed mechanical traction induces novel combinations of ferroelectric and magnetic properties. The fundamental understanding of the behaviour of these materials will help us develop new material systems with exciting possibilities in the design of advanced devices and sensors.

**DP1097203** Prof R van der Meyden; Dr K Engelhardt; A/Prof Y Moses; Prof Dr T Wilke

**Approved Project Title** **A formal foundation for security architecture**

**2010 :** \$ 105,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2804 COMPUTATION THEORY AND MATHEMATICS

**Administering Organisation** The University of New South Wales

## Project Summary

Security of computer systems is essential for the maintenance of privacy, confidentiality and integrity of personal, commercial and government data, and the trustworthiness of the computational devices that are embedded in critical societal infrastructure. However, current theoretical understanding of secure systems development is poor. The project will develop our understanding of an emerging approach to the design of secure systems and develop

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

verification methods that may be applied to guarantee systems security. Its outcomes will contribute to processes for certifying systems at very high levels of security, a requirement in defence and government settings that will become increasingly significant in the commercial sector.

**DP1095581** Dr V Venturi; A/Prof MP Davenport; Prof DA Price; Prof J Nikolich-Zugich; Prof AB Hill

**Approved Project Title** **Understanding the dynamics of T cell responses to chronic infection**

**2010 :** \$ 130,000

**2011 :** \$ 130,000

**2012 :** \$ 130,000

**2013 :** \$ 130,000

**2014 :** \$ 130,000

**Primary RFCD** 3202 IMMUNOLOGY

**ARF** Dr V Venturi

**Administering Organisation** The University of New South Wales

### Project Summary

The health, social, and economic impact of chronic infections on the Australian and global populations is enormous. A major obstacle to the development of vaccines against chronic infections is that we have a poor understanding of immune responses to persistent infections. We aim to use bioinformatics and mathematical modelling to understand immune responses to persistent viruses so that we can improve the long-term immune control of chronic viral infections such as the human immunodeficiency virus (HIV). This project will strengthen Australian research in the area of interdisciplinary approaches to immunology, which is becoming crucial to interpreting the rapidly increasing volume of data obtained using advanced experimental techniques.

**DP1093106** Prof MR Walter; Prof BA Neilan; Dr SC George; Prof RE Summons; Dr JW Schopf

**Approved Project Title** **Oxygenating the Earth: using innovative techniques to resolve the timing of the origin of oxygen-producing photosynthesis in cyanobacteria**

**2010 :** \$ 160,000

**2011 :** \$ 170,000

**2012 :** \$ 165,000

**2013 :** \$ 120,000

**2014 :** \$ 100,000

**Primary RFCD** 2603 GEOCHEMISTRY

**APF** Prof MR Walter

**Administering Organisation** The University of New South Wales

### Project Summary

The early Earth was a hostile place with little oxygen in the atmosphere. Then cyanobacteria ('blue-green algae') invented oxygen-releasing photosynthesis. That profound event affected many fundamental processes, from the course of evolution to the formation of ore deposits. However, estimates of when these bacteria originated are disputed with uncertainties of hundreds of millions of years. We will resolve those uncertainties. We have developed new analytical techniques that we will apply to well-preserved 2.7-2.8 billion-year-old rocks in Western Australia. We will couple that approach to the use of the latest genetic techniques to reveal the origins of living cyanobacteria.

**DP1096570** Prof RF Westbrook; Prof AS Killcross

**Approved Project Title** **Latent inhibition: Behavioural characteristics and neural substrates**

**2010 :** \$ 93,000

**2011 :** \$ 96,000

**2012 :** \$ 109,727

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of New South Wales

### Project Summary

Latent inhibition is an animal model of schizophrenia. It refers to the impairment in learned performance when a pre-exposed stimulus signals something of importance. The initial learning interferes with the subsequent learning. This effect fails to occur in schizophrenics but occurs after their treatment with antipsychotic medication. The project will provide the basis for a comprehensive theory of the processes involved in the effect and their neural substrates. Such a theory will clarify the processes and neural substrates disrupted in schizophrenia.

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

Students will receive training in behavioural neuroscience, and publication of results in journals and presentations at conferences will add to the reputation of Australian science.

**DP1093388** Prof MR Wilkins

**Approved Project Title** **Protein methylation: a fundamental regulator of the interactome**

**2010 :** \$ 95,000

**2011 :** \$ 95,000

**2012 :** \$ 95,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of New South Wales

## Project Summary

Proteins are the functional molecules of the cell. They interact with each other to form small 'protein machines' that are part of large, complicated networks. This study will examine how the cell makes tiny changes to proteins, through the addition of one carbon and two hydrogen atoms, and how this is important in the regulation of protein interactions. The proteins of baker's yeast, a common model organism, will be studied here. However, the findings will be directly relevant to understanding the function of many proteins in plants, animals and man.

**DP1096643** Prof AM Williamson; Dr ST Shorrocks; Ms H Hong

**Approved Project Title** **It's only human: Understanding why errors occur in skilled behaviour**

**2010 :** \$ 120,000

**2011 :** \$ 40,000

**2012 :** \$ 100,000

**Primary RFCD** 3212 PUBLIC HEALTH AND HEALTH SERVICES

**Administering Organisation** The University of New South Wales

## Project Summary

There is evidence that error plays a major role in the causes of workplace injury and errors in skilled behaviour are the most common type of error leading to occupational accidents. It is likely that skill-based error is also important in causing fatal and severe injury in other settings. If we want to reduce or prevent injury, tackling the causes of error, and especially skill-based error, must be a prime target. By reducing skill-based error in the workplace, current estimates suggest that loss of life would be reduced by about 200 cases per year and annual direct and indirect costs to the community by \$484 million. Similar benefits are likely to emanate from reducing skill-based error in other settings.

**DP1093026** Dr DP Wilson; Dr H Wand

**Approved Project Title** **Understanding spatial trends in HIV/AIDS infections in South Africa and Australia**

**2010 :** \$ 80,000

**2011 :** \$ 75,000

**2012 :** \$ 70,000

**Primary RFCD** 2399 OTHER MATHEMATICAL SCIENCES

**Administering Organisation** The University of New South Wales

## Project Summary

This project will develop quantitative methods that will be used to inform public health officials in understanding past and current HIV/AIDS epidemics as well as planning for the future of these epidemics. It will understand not only the behavioural and demographic characteristics of importance as risk factors for HIV infection in South Africa, the epicentre of the global HIV pandemic, but also the geographical spatial locations in which HIV cases are likely to emerge in the future. This project will also forecast the future geographical trends in Australia's changing HIV epidemic in order to plan for intervention strategies and prepare clinical practice appropriately.

**DP1096185** Prof AB Yu; Dr X Jiang; Prof E Wang; Dr A Brioude

**Approved Project Title** **Experimental and Theoretical Studies of Vanadium Oxide Nanostructures and Their Functional Properties**

**2010 :** \$ 195,000

**2011 :** \$ 205,000

**2012 :** \$ 200,000

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

2013 : \$ 280,000

2014 : \$ 120,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

QEII Dr X Jiang

**Administering Organisation** The University of New South Wales

## Project Summary

This project is primarily devoted to material science and nanotechnology, one of the cutting-edge areas in Australia's National Research Priority. Successful completion of this project will result in controlled synthesis, functional assembly and fundamental understanding of vanadium oxide nanostructures. The research findings will be useful for developing new and complex nanostructures for functional applications in lithium ionic batteries, catalysts and gas sensors. The conduct of this project will significantly expand the knowledge creativity of Australia in research in advanced materials.

**DP1097130** Prof AB Yu; Mr K Chu; Dr KJ Dong

**Approved Project Title** Discrete particle modelling and analysis of complex particle-fluid flows

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 120,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of New South Wales

## Project Summary

Multiphase processes are widely used in both conventional and modern industries in Australia and worldwide, however rarely reach more than 60% of design capacity because of a poor understanding of their fundamental characteristics. This project aims to overcome this problem using an extensive combined fundamental and applied approach. The resulting theories, computer models and simulation techniques will be applied to improve process design, control and optimisation. Consequentially, productivity and Australian competitiveness will be significantly enhanced in its most important industries such as minerals, metallurgical, chemical, energy, and materials.

**DP1094194** Dr W Zhang; Prof X Xia

**Approved Project Title** Efficient Signal Transmission Techniques for Future Wireless Communications Systems

2010 : \$ 50,000

2011 : \$ 50,000

2012 : \$ 50,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of New South Wales

## Project Summary

The project aims at developing efficient signal transmission techniques that enable advanced telecommunication services to achieve high quality and cover greater geographic areas with low cost and minimal infrastructure. The outcomes of the project will enable high performance, high data rate and cost-effective wireless communications in Australia. The outcomes can be directly applied to current and future wireless LAN, cellular mobile networks, WiMax systems, WiFi and other wireless networks. In addition, it will support and enhance the social and economic benefit of wireless access to broadband networks in rural and regional Australia.