

**New South Wales**

**The University of Sydney**

**DP0770299** Dr DM Alais; A/Prof S Carlile

**Approved Project Title** **Audiovisual interactions in human perception: exploring the temporal dimension and the role of attention**

**2007 :** \$153,780  
**2008 :** \$101,671  
**2009 :** \$148,609  
**2010 :** \$20,778  
**2011 :** \$134,230

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Sydney

**Project Summary**

The proposed studies provide an extensive research program into audiovisual interactions that occur in human perception of the external world. These two senses are commonly co-activated when an external event produces patterns of both light and sound (e.g., human speech; traffic). The project's main aim is to explore how timing differences and other temporal factors affect audiovisual integration. The will benefit basic science by furthering our knowledge of multisensory integration in the human brain. This knowledge has potential for practical applications ranging from AV synching in streaming and video to AV virtual realities.

**DP0773172** A/Prof JK Beattie; Prof JW White

**Approved Project Title** **Water at Hydrophobic Surfaces**

**2007 :** \$250,000  
**2008 :** \$215,000  
**2009 :** \$200,000

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

**Administering Organisation** The University of Sydney

**Project Summary**

The properties of water define the nature of life on this planet. When water encounters a hydrophobic surface - at the air/water interface, in contact with unreactive solids such as Teflon, or at an oil drop, our recent experiments indicate that the water dissociates more readily into protons and hydroxide ions - undergoes autolysis - than in bulk water. Furthermore, the hydroxide ions are preferentially adsorbed at the surface, giving it a negative charge. This project will test the generality and implications of this novel concept. The results will range across physics, chemistry, biology and their associated technologies, a consequence of the ubiquitous importance of water.

**DP0774259** A/Prof JK Beattie

**Approved Project Title** **Electroacoustic and Acoustic Characterisation of Nanoporous Colloids**

**2007 :** \$120,000  
**2008 :** \$90,000  
**2009 :** \$90,000

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

**Administering Organisation** The University of Sydney

**Project Summary**

Nanoporous materials have an enormous technological importance in many different industries, both traditional and advanced. New technologies require new materials, which are being produced in thousands of laboratories worldwide. The methods for characterising these materials are slow and expensive. A new suite of measurements will be developed, based on acoustic methods, that is rapid and relatively inexpensive. It will not only give parameters such as particle size, porosity and pore size, which are complementary to existing methods, but also important new information about charge and conductivity that is not presently available.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773107** Dr KA Beilharz  
**Approved Project Title** **Gesture-controlled interaction to enrich information access**  
**2007 :** \$90,000  
**2008 :** \$65,000  
**2009 :** \$60,000  
**2010 :** \$40,000  
**Primary RFCD** 4104 DESIGN STUDIES  
**Administering Organisation** The University of Sydney

### Project Summary

This project is a study of gestural computing (enabled by sensors such as pressure mats, infra-red sensors and video tracking) which aims to move away from desk-bound, restrictive computing environments and towards computing that is more integral to the building structure and space itself. Linking gesture controllers and information sonification delivers a unique bridge between data and human interaction. Enriching the capacity to access information in dense workplace environments is central to improved efficiency across the Australian workforce. Greater accuracy and enhanced techniques for controlling information in visually-overloaded work environments contribute to Australia's competitive leadership in a global marketplace.

**DP0770997** A/Prof AV Betts; Dr P Jia; Dr X Wu; Prof JP Mallory  
**Approved Project Title** **East meets West: an archaeological study of early contact between China and Eurasia**  
**2007 :** \$95,001  
**2008 :** \$79,001  
**2009 :** \$85,001  
**2010 :** \$73,001  
**Primary RFCD** 4302 ARCHAEOLOGY AND PREHISTORY  
APD Dr P Jia  
**Administering Organisation** The University of Sydney

### Project Summary

The project will link Chinese and Australian researchers in a collaborative programme exploring the origins of cultural contact between China and the West. Through the work of a team of international specialists, this fresh initiative will bring western analytical techniques together with Chinese archaeological experience to create a new and robust picture of the evidence for early cultural contact. From this we will study the early movements of Indo-European populations and examine the question of the origins of early metal production in China.

**DP0771889** Prof MM Bilek; Dr RN Tarrant; Dr VJ Keast; Prof JM Schneider  
**Approved Project Title** **New nanolaminate ternary and quaternary alloy phases by thin film synthesis**  
**2007 :** \$250,000  
**2008 :** \$225,000  
**2009 :** \$200,000  
**Primary RFCD** 2914 MATERIALS ENGINEERING  
**Administering Organisation** The University of Sydney

### Project Summary

The availability of suitable materials is a driver of new technologies. We will develop a new class of ternary and quaternary alloys with nanolaminate structures at the atomic scale using a combination of theoretical modeling, novel thin film synthesis and advanced characterization methods. The nanostructure of these materials is expected to promote a rare combination of metallic and ceramic like properties, such as low friction, high mechanical strength, resistance to heat shock, fracture, corrosion and oxidation, up to very high temperatures. Careful characterisation of the growth process and structure-property relationships will allow us to develop methods of tailoring the property mix for operation in harsh environments.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773175** A/Prof L Burns; Prof RE Krever

**Approved Project Title** **Safeguarding the domestic tax base in a world without investment borders**

**2007 :** \$40,000

**2008 :** \$40,000

**2009 :** \$40,000

**Primary RFCD** 3901 LAW

**Administering Organisation** The University of Sydney

### Project Summary

Reform of Australia's tax rules applying to business investments abroad will ensure the continued protection of the domestic tax base while removing disincentives that discourage Australian enterprises from investing overseas and foreign enterprises from using Australia as a site for regional investment. Enabling more Australian firms to invest abroad and attracting foreign capital inflows by investors seeking to use Australia as a politically stable platform for foreign investment will contribute to the restoration of a balance of payments equilibrium and strengthen the Australian economy vis-à-vis those of Australia's key regional trading partners.

**DP0772446** Dr M Byrne

**Approved Project Title** **Neurogenesis in bilateral larval and radial adult body plans: identification of echinoderm homologues of the chordate central nervous system**

**2007 :** \$76,000

**2008 :** \$76,000

**2009 :** \$76,000

**Primary RFCD** 2702 GENETICS

**Administering Organisation** The University of Sydney

### Project Summary

The modern synthesis of embryology and gene expression studies, as undertaken in this project with sea stars, is a major way forward to achieve advances in our understanding of animal evolution and generate new insights into the mystery that surrounds the origin of our own phylum, the Chordata. This project utilises life history diversity in species that are unique Australian fauna. Extreme life history diversity as seen in these sea stars is unparalleled on a global scale and provides an important resource to generate new discoveries on the processes underlying evolution in the sea and enhance our understanding of marine systems.

**DP0770504** Dr JM Cairney; Dr D Larson

**Approved Project Title** **New Approaches to Understanding Grain Boundary Chemistry**

**2007 :** \$120,000

**2008 :** \$115,000

**2009 :** \$115,000

**Primary RFCD** 2913 METALLURGY

**Administering Organisation** The University of Sydney

### Project Summary

This project will provide a fundamentally better understanding of the relationship between grain boundary segregation and the recrystallisation behaviour of steel and Al alloys. This knowledge will lead to more efficient thermomechanical processing techniques, which will be of benefit to Australia's steel and light alloy industries. The experimental techniques to be developed will be the first of their kind. They have enormous potential for use in future segregation studies of other alloy systems and are expected to make a major contribution to fundamental and applied research over the next few years.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770692** Dr J Canning; Dr IM Bassett

**Approved Project Title** **Advanced Laser, Sensor and Diagnostic Technologies Using New Generation Micro- and Nano- Structured Fibres and Gratings**

**2007 :** \$284,900  
**2008 :** \$250,000  
**2009 :** \$280,000  
**2010 :** \$175,000  
**2011 :** \$175,000

**Primary RFCD** 2999 OTHER ENGINEERING AND TECHNOLOGY  
APF Dr J Canning

**Administering Organisation** The University of Sydney

### Project Summary

The project aims to provide the next generation of laser and sensor technologies, benefiting not only advanced instrument industries but also others involved with materials processing, sensing diagnostics, biomedicine and defence. The search for a universal model of light interactions with all photosensitive materials, coupled with a demonstration of nanotechnology within a fibre, will lead to new gratings and fibres that underpin these technologies as well as open up new techniques and processes such as practical radiation hardening of optical waveguides.

**DP0772368** Dr JJ Cannon; Dr DF Holt

**Approved Project Title** **Constructive Representation Theory and its Applications**

**2007 :** \$109,000  
**2008 :** \$107,000  
**2009 :** \$105,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** The University of Sydney

### Project Summary

The algorithms developed will make it possible to determine the different ways (representations) in which a group of symmetries may be realised as transformations of some space. Such knowledge is required in many areas including differential equations, digital signal processing, engineering ('strut-and-cable' constructions), the design of telephone networks, crystallography and quantum information processing. The high-performance tools for linear algebra developed will also find application in cryptography and coding theory. This work represents the latest stage in a long-term project to discover practical algorithms for elucidating the properties of complex algebraic structures - an area where Australia is a world-leader.

**DP0774697** Dr JR Cass

**Approved Project Title** **Filters reveal what flicker conceals: temporal processing in the human visual system**

**2007 :** \$63,001  
**2008 :** \$63,001  
**2009 :** \$63,001  
**2010 :** \$63,001

**Primary RFCD** 3801 PSYCHOLOGY  
APD Dr JR Cass

**Administering Organisation** The University of Sydney

### Project Summary

I have recently discovered a new form of camouflage using 10Hz luminance flicker. This project will quantify this effect and examine the extent to which it generalises across colour and spatial dimensions and to video sequences depicting natural scenes. This information is expected to provide foundational information to technologies relating to national security that rely on visual concealment. This research will examine the extent to which filtering out these camouflaging frequencies enhances our sensitivity to low temporal frequency information. This decamouflaging aspect of my research is expected to improve the clarity of digital video-based technologies including ultrasound, educational, info-tainment and defence applications

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773755** A/Prof H Chan; Dr R Yang

**Approved Project Title** **Discrete particle simulation of powder dispersion in pharmaceutical aerosol inhalers**

**2007 :** \$110,000

**2008 :** \$90,000

**2009 :** \$90,000

**Primary RFCD** 2906 CHEMICAL ENGINEERING

**Administering Organisation** The University of Sydney

### Project Summary

A successful completion of the project will i) greatly enhance the Australian R&D profile and capabilities of both computational modelling and pharmaceutical aerosol research in the world; ii) provide an improved delivery of therapeutic dose to patients via inhalers with better performance to enhance the therapeutic benefits; iii) enable wide availability of inexpensive and effective pharmaceutical inhalation products to the Australian community for the treatment of asthma and other diseases, iv) facilitate environmentally friendly technology since powder aerosol delivery does not require any harmful organic solvents to operate.

**DP0770991** Dr M Charleston; Dr LS Jermin

**Approved Project Title** **The Origin and Evolution of the Animal Phyla inferred from Analysis of Multiple-Gene Data**

**2007 :** \$90,000

**2008 :** \$88,000

**2009 :** \$85,000

**Primary RFCD** 2702 GENETICS

**Administering Organisation** The University of Sydney

### Project Summary

Australia has recently begun an extensive research programme in the genomics of our flora and fauna. The enormous amounts of data that emerge from such research are highly complex, but they hold the key to understanding how biological organisms change over time. Our research will untangle that data to answer fundamental, unanswered questions in modern science: How did the animal groups originate? How are they related to each other? How is biodiversity changing? The answers to these questions and the new analytical tools we will develop will put Australia firmly on the international "map" of Bioinformatics.

**DP0773589** A/Prof CW Clifford

**Approved Project Title** **Visual Coding of Motion and Form**

**2007 :** \$102,000

**2008 :** \$135,000

**2009 :** \$129,000

**2010 :** \$130,000

**2011 :** \$60,000

**Primary RFCD** 3801 PSYCHOLOGY

ARF A/Prof CW Clifford

**Administering Organisation** The University of Sydney

### Project Summary

Understanding how brains solve the problems of vision may prove crucial in understanding how to build intelligent robots capable of seeing, as well as in developing more sophisticated virtual reality-type computer-based technologies. Moreover, given that a large proportion of our cortex is given over to visual processing, anything we can learn about the operation of the visual system might prove relevant to our understanding of cortical processing in general as well as bringing us one step closer to an explanation of how activity in our brains gives rise to the experience of conscious perception. This project will directly expand Australia's knowledge-base regarding neural processing in general and visual perception in particular.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770971** Prof MB Clunies Ross

**Approved Project Title** **The Language of Old Norse Poetry, an important intellectual achievement of the Western Middle Ages**

**2007 :** \$105,282  
**2008 :** \$113,653  
**2009 :** \$127,010

**Primary RFCD** 4202 LITERATURE STUDIES

**Administering Organisation** The University of Sydney

### Project Summary

Old Norse poetry, produced from the Viking Age until the end of the Middle Ages, is one of the most important achievements in European literature. Thematically, it ranges from praise of Viking kings to Christian devotion; in metre and style it is extremely elaborate. It has applied value to a range of disciplines, including history, archaeology, linguistics and religious studies. This project will make Norse poetic language more accessible to scholars and the general public by providing new resources in the English language for its understanding, superseding previous studies because of the use of fully revised primary data.

**DP0774320** Prof DI Cook

**Approved Project Title** **Phospholipids and kinases as regulators of epithelial sodium channels**

**2007 :** \$157,548  
**2008 :** \$148,000  
**2009 :** \$140,000

**Primary RFCD** 2706 PHYSIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

The intracellular signalling pathways that will be identified in this project will facilitate the development of novel therapies for the many conditions in which the activity of epithelial sodium channels is abnormal. These include influenza, otitis media, high blood pressure and cystic fibrosis. It will also provide training for post-doctoral fellows and research students in a number of the key techniques in modern cellular physiology.

**DP0772452** Prof DA Day; Dr M Ludwig; Dr PM Smith

**Approved Project Title** **Symbiotic transport proteins in legumes**

**2007 :** \$90,000  
**2008 :** \$88,000  
**2009 :** \$85,000

**Primary RFCD** 3002 CROP AND PASTURE PRODUCTION

**Administering Organisation** The University of Sydney

### Project Summary

Some plants form a symbiosis with soil bacteria (rhizobia) that convert atmospheric nitrogen to ammonia which is then supplied to the plant. This enables legumes to grow without application of nitrogen-based fertilizer, avoiding environmental problems such as run-off and land degradation, thereby contributing to sustainable agriculture practise. We will investigate the interactions between plant and rhizobia, focusing on identifying genes and proteins which govern nutrient exchange between the partners and development of the special structures in the roots that house the bacteria. Subsequent manipulation of these genes and proteins may allow us to identify control points and enhance nitrogen fixation.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0774331** Dr M de Rosnay

**Approved Project Title** **Acquiring Social Fears in Infancy: Underlying Mechanisms and Implications for Behavioural Intervention**

**2007 :** \$99,001

**2008 :** \$88,001

**2009 :** \$94,001

**2010 :** \$80,001

**Primary RFCD** 3801 PSYCHOLOGY

APD Dr M de Rosnay

**Administering Organisation** The University of Sydney

### Project Summary

Social fears are wide-spread in the community and crippling for those affected. This study aims to (i) isolate parental behaviours and practices that result in elevated and persistent infant fear within social interactions, and (ii) establish the psychological mechanisms (e.g., observational learning) and temperamental features that underpin the transmission of social fears from mother to infant. By elucidating the processes involved in the transmission of social fears, this investigation will enrich theories of emotional development in infancy, contribute to our understanding of serious conditions such as childhood shyness and Social Phobia, and provide an empirical basis for the development of effective methods of early intervention.

**DP0773754** Prof CR Dickman; Dr GM Wardle

**Approved Project Title** **Biodiversity enhancement in arid Australia: the importance of micro-refugia and biotic interactions**

**2007 :** \$90,000

**2008 :** \$88,000

**2009 :** \$85,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** The University of Sydney

### Project Summary

This project will dramatically increase our understanding of the factors that influence the biodiversity of Australia's deserts, and thus improve our ability to manage these iconic landscapes for both conservation and production needs. It will attract attention from the international community by helping to resolve contentious theoretical debate about the function of refuge habitats, and how species interact with each other to influence overall diversity. It will provide the longest time series of ecological data available for any Australian desert, and hence provide a key resource for increasing community awareness and achieving sustainable management of biodiversity throughout the continent's arid interior.

**DP0772252** Dr A Dong; Prof T Kvan

**Approved Project Title** **A study of the potential for the public to be involved in the design of large scale public works**

**2007 :** \$93,977

**2008 :** \$94,053

**2009 :** \$94,905

**Primary RFCD** 4104 DESIGN STUDIES

**Administering Organisation** The University of Sydney

### Project Summary

Public acceptability of infrastructure such as desalination plants or new public spaces, is a concern for the Australian Commonwealth and State Governments. However, tensions exist between the need for expedient planning and development of critical public infrastructure and Australian principles of democratic social and economic participation. The instrument developed by this research will inform public policy to negotiate and understand arrangements that balance social participation with Government objectives.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770619** A/Prof KM Downard

**Approved Project Title** **Proteomics of the Influenza Virus for In-field Surveillance**

**2007 :** \$105,000

**2008 :** \$104,000

**2009 :** \$120,000

**Primary RFCD** 2503 ORGANIC CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

The influenza virus continues to pose a serious health risk to Australians and remains a leading cause of death. The molecular characterisation of emerging strains of the virus lies at the heart of current surveillance procedures vital to vaccine preparation and the development of new anti-viral drugs. This research will advance a world-first proteomics surveillance of the virus developed in this laboratory that will enable it to be characterised in-field at the site(s) of infection outbreaks. This rapid response is vital, particularly in the event of a pandemic or a deliberate release of the virus in a bioterrorist attack.

**DP0772551** Dr X Du; Prof Y Meng

**Approved Project Title** **Novel nanostructured high energy cathode material**

**2007 :** \$90,000

**2008 :** \$85,000

**2009 :** \$85,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

APD Dr X Du

**Administering Organisation** The University of Sydney

### Project Summary

Recently, the demand for rechargeable batteries has exploded due to the enormous increase in the variety and number of miniaturized devices. It is expected that this demand for high capacity rechargeable batteries as energy sources will become even greater in the future. This program is focused to develop novel high performance cathode materials for lithium rechargeable batteries. The outcomes of the project will be of great benefit to develop new class rechargeable batteries that are economical, lightweight, environmently benign and high energy.

**DP0774006** Dr I Einav

**Approved Project Title** **The micro-thermo-mechanics of sand crushing in geotechnical collapse problems**

**2007 :** \$100,000

**2008 :** \$90,000

**2009 :** \$90,000

**Primary RFCD** 2907 RESOURCES ENGINEERING

**Administering Organisation** The University of Sydney

### Project Summary

Oil and gas exploration is a major industry in Australia. Collapse problems in the soil to which structures such as oil rigs are anchored are a major challenge, involving issues of safety, longevity and maintenance. Research on this topic has been devoted to non-crushable sands, but Australia's offshore seabed is rich in breakable calcareous sediments. We will create a novel theory and visualisation techniques that will allow us to gain a deep understanding of sand crushing and will be a major step towards minimising the occurrence of catastrophic failures in the offshore oil and gas industry.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0771559** Dr SM Firth; Prof RC Baxter

**Approved Project Title** **Proteolysis of binding protein complexes regulates bioavailability of insulin-like growth factor (IGF)**

**2007 :** \$78,000

**2008 :** \$78,000

**2009 :** \$78,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

We aim to determine how growth factors kept inactive in complexes in the blood can become free and active. The fundamental knowledge gained will help us understand the regulation of growth factors' availability to tissues and develop novel or more effective delivery systems for therapeutic growth factors that could impact on several conditions including diabetes, growth disorders and critical illness. This project therefore benefits Australia at two levels: by maintaining our international leadership in the study of these important growth-regulatory molecules, and by providing a better understanding of physiological mechanisms that might benefit the health of Australians and provide opportunities to develop novel therapeutics.

**DP0774577** Dr A Fitzmaurice

**Approved Project Title** **Understanding the concept and meaning of freedom in Western history**

**2007 :** \$54,375

**2008 :** \$32,989

**2009 :** \$39,404

**2010 :** \$44,151

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Organisation** The University of Sydney

### Project Summary

This project directly engages with current political and social debate and particularly with the National Research Priority 'Safeguarding Australia'. The priority goal 'Understanding our region and the world' is at the heart of the project because it addresses the principal political problem following from September 11, 2001: namely, the price of freedom. The project's principal national benefit will be to use history to challenge our very understanding of the nature of freedom. The project questions the paradox that freedom can be assured by compromises made in the name of security and that, in this sense, freedom has a 'price'.

**DP0774404** Prof SC Fleming; Dr S Min

**Approved Project Title** **Nano-Engineered Glass for Next Generation Optical Fibre Devices and Systems**

**2007 :** \$117,000

**2008 :** \$117,000

**2009 :** \$117,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Sydney

### Project Summary

Optical fibre and fibre devices are a major technology platform of the IT revolution. The global photonics market is valued at \$220bn, with Australian industry contributing ~\$500m to the Australian economy. \$158m is from communications photonics companies, largely SMEs, and comprises roughly 1% of the global telecoms photonic market. For Australia to be a significant player in this very competitive environment, the industry needs a continuing flow of research innovations. The breakthrough science in this research project will extend Australia's world leading speciality fibre and fibre device capabilities and the innovation will succour the growing Australian industry, ensuring a place on the next wave of deployment of photonic technology.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772706** Dr O Gal; Mr CT Wolfe

**Approved Project Title** **The origins of scientific experimental practices: from the anatomical theatre to the conversations of the Royal Society**

**2007 :** \$98,324  
**2008 :** \$130,974  
**2009 :** \$137,010  
**2010 :** \$90,240

**Primary RFCD** 3706 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE  
APD Mr CT Wolfe

**Administering Organisation** The University of Sydney

### Project Summary

This research will offer new insight into the emergence of scientific empiricism, and will thus provide an important contribution towards informed public discussion concerning science education, the relations between the sciences and between science and general culture. This discussion is incumbent on us in our quest for a knowledge-based economy and a proper place in an increasingly competitive world of science-led industry and commerce. Australia enjoys a prime international position in history and philosophy of science scholarship, and in the field of seventeenth century science in particular. This project will maintain and enhance this position.

**DP0773140** Dr DA Gell

**Approved Project Title** **Investigating the molecular function of alpha-Haemoglobin stabilising protein.**

**2007 :** \$130,000  
**2008 :** \$125,000  
**2009 :** \$120,000  
**2010 :** \$120,000  
**2011 :** \$120,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY  
ARF Dr DA Gell

**Administering Organisation** The University of Sydney

### Project Summary

The research described in this proposal will provide new insights into haemoglobin regulation and redox chemistry in erythrocytes. Deregulation of these processes gives rise to a number of debilitating diseases, including varieties of anaemia and thalassaemia-in Australia it is estimated that 3% of the population could be carriers of b-thalassaemia mutations. Given the contribution of free aHb to the pathology of b-thalassaemia, understanding the specific aHb-binding factor, AHSP is a goal of national significance. In the long term, manipulation of AHSP function through gene therapy may have a direct role in the treatment of thalassaemia.

**DP0773577** Prof J Götz; Dr LM Ittner

**Approved Project Title** **Novel cellular functions of the microtubule-associated protein tau: Physiological and pathological implications**

**2007 :** \$160,000  
**2008 :** \$150,000  
**2009 :** \$140,000

**Primary RFCD** 3207 NEUROSCIENCES

**Administering Organisation** The University of Sydney

### Project Summary

The social and economic burden of Alzheimer's disease (AD) is enormous, and by 2040 more than 500,000 Australians will suffer from this disease. A key histopathological hallmark of this and many other related diseases are insoluble deposits of the protein tau. Research into novel functions of tau in signalling and transport (both of which are heavily compromised in diseased brains) will be followed directly by assay development for tau-directed drug screening. The national benefit of this research is manifold by (a) patenting new data, (b) developing treatment strategies for an un-curable disease, and (c) establishing links to the growing Australian biotech industry (in addition to existing links to international pharmaceutical companies).

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0774425** Prof GE Grau; Prof NH Hunt

**Approved Project Title** **Microparticles as effectors of microvascular alterations in brain inflammation**

**2007 :** \$90,000

**2008 :** \$88,000

**2009 :** \$85,000

**Primary RFCD** 3206 MEDICAL PHYSIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

Cerebral malaria (CM) kills many children worldwide, but we do not understand why their small blood vessels in the brain become obstructed. We found that tiny elements detached from cell membranes, called microparticles (MP), are dramatically elevated in the blood during CM. Our results strongly suggest that these MP are important in CM development. We have found that some drugs block the release of MP and the stickiness of malaria parasites to blood vessels. Our project will tackle the conditions of MP production and define new drugs to prevent it. It also will explain how the brain becomes affected by high numbers of MP. Our results will cast new light on why the brain functions abnormally when its blood vessels become modified.

**DP0771888** Prof R Graycar; Prof JJ Morgan

**Approved Project Title** **A study of law reform and its responses to rapid social and community change**

**2007 :** \$56,000

**2008 :** \$80,000

**2009 :** \$84,000

**Primary RFCD** 3901 LAW

**Administering Organisation** The University of Sydney

### Project Summary

This research is designed to assist law reform agencies and other bodies charged with ensuring that the law responds to rapid social change to design and implement best practice modes of responding most effectively both to the changing nature of the legal problems that arise in the 21st century and to the changing constituencies that are affected by them. Through three cases studies: family law reform, laws governing defences to domestic homicide and tort law reform the project will assess the extent to which they are responsive to the concerns of those traditionally excluded from the legal mainstream.

**DP0774658** Dr C Grillet

**Approved Project Title** **Highly nonlinear all-optical switches using chalcogenide photonic crystal**

**2007 :** \$77,030

**2008 :** \$77,030

**2009 :** \$77,030

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

APD Dr C Grillet

**Administering Organisation** The University of Sydney

### Project Summary

Business productivity and economic prosperity are increasingly correlated with the speed of a country's Internet connections and computer infrastructure. Australia will benefit from dramatic improvements to communications technology arising from this research, through access to improved services and through the creation of enterprises formed to commercialise our novel technology. The benefits from the eventual development of ultrahigh speed networks include better rural and regional connectivity, improved business productivity and the emergence of new high-bandwidth services, such as telemedicine and flexible learning.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773953** Prof TW Hambley

**Approved Project Title** **Rational Optimisation of the Uptake of Metal-Based Anti-Cancer Agents by Tumours**

**2007 :** \$100,000

**2008 :** \$100,000

**2009 :** \$100,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

In this project will develop an understanding of how anticancer drugs are taken up, distributed and modified in tumours. The information gathered will be of value to all those developing new anticancer drugs and we will then use it to develop new drugs that more selectively target tumours and therefore have reduced side effects. Successful development of less toxic anticancer agents would lead to less debilitating treatment, more effective treatment, and an increase in the number of patients effectively treated. Effective anticancer drugs can also be very large income earners for Australia.

**DP0771154** Dr JA Harris; Prof F Westbrook

**Approved Project Title** **Stimulus Representation in Associative Learning: Testing a New Computational Model**

**2007 :** \$85,000

**2008 :** \$85,000

**2009 :** \$130,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

This research investigates how animals represent their experiences when learning about the associations that exist between events in their world. This is crucial for our understanding of associative learning in general, and will also provide valuable theoretical knowledge to guide research into the neural basis of learning. It will also have important implications for the development of computational models in artificial intelligence and cognitive neuroscience programmes, and for applications of learning principles to clinical settings (such as the treatment of phobias and drug addiction).

**DP0772893** Prof P Harrowell; Prof CA Angell

**Approved Project Title** **Fluctuation Effects in Non-Crystallising Liquids**

**2007 :** \$494,061

**2008 :** \$434,061

**2009 :** \$334,061

**2010 :** \$254,061

**2011 :** \$204,061

**Primary RFCD** 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

APF Prof CA Angell

**Administering Organisation** The University of Sydney

### Project Summary

Understanding the behaviour of liquids colder than their freezing temperature is important in areas as diverse as metal alloy preparation, prevention of cell damage in plants and animals at low temperatures, extending the working temperature range of new high voltage automotive batteries and controlling drug delivery in pharmaceuticals. Advances in these areas would represent important new manufacturing opportunities in industries already established in Australia. In this project the fundamental physical chemistry of supercooled liquids is developed and applied to a number of these technological challenges.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772996** A/Prof SC Hayes; A/Prof MH Levy  
**Approved Project Title** Intellectual disability in courts and police cells  
**2007 :** \$105,694  
**Primary RFCD** 3212 PUBLIC HEALTH AND HEALTH SERVICES  
**Administering Organisation** The University of Sydney

### Project Summary

Benefit to the nation accrues because offenders with intellectual disability will be accurately identified early in their contact with the criminal justice system (CJS), and appropriate diversions from the CJS as well as rehabilitation programs can be implemented, thus producing cost-savings in all jurisdictions. The community benefits because offenders with ID can receive appropriate service provision, based on evidence provided by this study. The individual's ties to the community will be maintained and on the community will be supported to assist the individual. Justice health systems, in staff management and training areas, will benefit. The outcomes will benefit educational programs for the judiciary, police and lawyers.

**DP0773923** Prof T Heneghan  
**Approved Project Title** The influence of Contemporary Japanese architecture: its meanings and its miss-readings.  
**2007 :** \$90,199  
**2008 :** \$92,979  
**2009 :** \$99,267  
**Primary RFCD** 3101 ARCHITECTURE AND URBAN ENVIRONMENT  
**Administering Organisation** The University of Sydney

### Project Summary

Contemporary architecture and urbanism in Australia has generally been concerned with addressing 'modernity' while little concerned with specific culture or place, and with little discernable ideology. Consequently, the City of Sydney is much used by international film-makers as an undifferentiated generic metropolis backdrop. In contrast, Japan's contemporary architects have developed a politically-charged architecture which registers the complexity of their national identity while turning its back on nationalism. This project will contrast the ideologies of leading contemporary architects in Japan and Australia and will serve as a benchmark against which contemporary Australian architecture can be assessed.

**DP0770618** Prof DA Hensher; Prof PR Stopher  
**Approved Project Title** Development of a behavioural system of stated choice models: modelling behavioural, pricing and technological opportunities to reduce automobile energy levels  
**2007 :** \$72,522  
**2008 :** \$93,024  
**2009 :** \$98,848  
**Primary RFCD** 3504 TRANSPORTATION  
**Administering Organisation** The University of Sydney

### Project Summary

Automobile use is attributed with over 70% of CO2 emissions from the transport sector. This project delivers a new framework to assess the impact of policies to reduce CO2 and other energy sources associated with existing ICE fuel sources and a range of scenarios that involve futures with alternative fuels. The proposed framework will radically change the approach used by practitioners in prediction, and provide a way of capturing behavioural responses of car users to new environmental futures, in which price, performance, distribution and maintenance play a crucial role in adopting environmentally friendly fuels and vehicle designs. Australia lacks this behavioural capability.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770633** Prof DA Hensher  
**Approved Project Title** **Integrating Accident and Travel Delay Externalities in an Urban Speed Reduction Context**  
**2007 :** \$77,522  
**2008 :** \$78,024  
**2009 :** \$83,848  
**Primary RFCD** 3504 TRANSPORTATION  
**Administering Organisation** The University of Sydney

### Project Summary

The recognition that accident externalities are not independent of travel delays, and hence travel time savings and losses will promote a serious policy rethink about strategies designed to reduce the risk of exposure to accidents. The evidence is designed to identify that additional externality that has to be factored into the accident costs to recognise the other sources of externality typically ignored in accident costing and speed restriction studies. The implication on the development of a national program of road safety is likely to be profound.

**DP0770913** A/Prof RD Herbert; Prof S Gandevia; A/Prof LE Bilston  
**Approved Project Title** **Passive mechanical properties of human muscles**  
**2007 :** \$150,000  
**2008 :** \$140,000  
**2009 :** \$130,000  
**Primary RFCD** 3214 HUMAN MOVEMENT AND SPORTS SCIENCE  
**Administering Organisation** The University of Sydney

### Project Summary

Australia has a strong record in the discipline of biomechanics. The proposed studies will help maintain Australia's standing in the discipline. They will provide fundamental new data on the properties of human muscles and basic insights into muscle growth and adaptation. The data will be used to develop more refined biomechanical models than is currently possible. The studies will also provide training in world-leading research methods for two PhD students and a research associate.

**DP0772403** Dr CR Hilliard  
**Approved Project Title** **Complex Words: Literary Judgments in the British Commonwealth, 1920-1970**  
**2007 :** \$68,705  
**2008 :** \$56,134  
**2009 :** \$56,907  
**Primary RFCD** 4301 HISTORICAL STUDIES  
**Administering Organisation** The University of Sydney

### Project Summary

Examining the 'traffic' in ideas about literature between Britain and Australia in the context of a broad comparative study will add a historical perspective to contemporary debates over globalization and 'cultural imperialism', and Australian culture's place in those debates. Because the project engages with questions that are studied extensively by historians elsewhere in the world, it will integrate Australian history further into European and North American discussions of imperialism and the circulation and reception of ideas and books.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772037** Dr AO Holcombe; Prof P Cavanagh

**Approved Project Title** **Mobile computation in human perception and feature binding**

**2007 :** \$90,000

**2008 :** \$66,000

**2009 :** \$71,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

Perception is so complex that still we cannot give computers more than a fraction of the human ability to perceive things. Experiments with humans can unravel the computations that underlie human abilities. Here we focus on distinguishing between perceptual mechanisms that analyze information from only patches of the visual world and those that combine information from across the visual field as an object moves across it. Results should also help to understand the general issue of how the brain combines information from different groups of neurons. Australian understanding of brains should be advanced, benefiting neuroscience, medicine, and eventually computer science.

**DP0771523** Prof A Jamalipour

**Approved Project Title** **Cross-Correlated Security and Service Quality in Heterogeneous Mobile Communication Networks**

**2007 :** \$110,780

**2008 :** \$103,000

**2009 :** \$90,030

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Sydney

### Project Summary

Mobile telecommunication infrastructures constitute the vital elements of all developed countries and therefore their reliability and integrity has a profound role in a sustained national economy progress. This project will provide a uniquely practical and long-term solution to the Internet security threat even after introduction of new mobile applications and services. The project will put Australia on the frontbench of the extensive research activities worldwide in the field of mobile network security and quality of service. This project will protect the nation's most valuable data infrastructure from service interruption as a result of a sudden data traffic load increase.

**DP0771064** Dr DS Jarvis; Dr T O'Callaghan

**Approved Project Title** **Political Risk, Institutions and Regulatory Regimes: Business, Foreign Investment and Public Administration in Asia**

**2007 :** \$90,000

**2008 :** \$76,000

**2009 :** \$90,000

**Primary RFCD** 3601 POLITICAL SCIENCE

**Administering Organisation** The University of Sydney

### Project Summary

Rating accurately the risk environment of emerging economies has always been problematic. Insufficiently developed methodological tools and the lack of institutional and regulatory data make the process imprecise. This project overcomes this problem, developing a new industry based risk assessment system for understanding political risk to commercial activities and foreign investors in nine of Asia's most rapidly developing economies. The study, one of the first to correlate institutional and regulatory forms to the incidence, severity and recurrence of risk, will deepen our knowledge of political and regulatory institutions in Asia and provide investors with the ability to navigate those environments successfully.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772004** Dr CT Jin; A/Prof IS Burnett

**Approved Project Title** **Beamforming with acoustic vector sensors for audio user interfaces**

**2007 :** \$95,000

**2008 :** \$92,000

**2009 :** \$90,000

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

**Administering Organisation** The University of Sydney

### Project Summary

We aim to create new Audio User Interfaces (AUIs) for the automatic separation and annotation of audio from complex sound scenes using acoustic vector sensor beamforming technology. Specifically, we will develop: speech AUIs for noisy, multi-talker, reverberant environments; and sound transcription AUIs for the deaf. Ultimately, users will be able to walk into a room, hold conversations and leave with a searchable, automatically-generated transcript of the audio events, tagged with metadata. The application of these technologies will create new possibilities for recording audio in the music, radio, TV industries, and future home based audio communication systems.

**DP0772006** A/Prof SH Kable

**Approved Project Title** **Molecular signatures of complex photodissociation reactions**

**2007 :** \$145,000

**2008 :** \$100,000

**2009 :** \$110,000

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

**Administering Organisation** The University of Sydney

### Project Summary

All energy on earth comes from the sun, either directly (e.g photosynthesis) or indirectly (e.g fossil fuels). Photochemistry is the study of how this light is absorbed and what happens to a molecule afterwards. Despite significant experimental and theoretical advances in the past decade (some in our lab), scientists still cannot predict the outcomes of most photochemical reactions. In this project we will determine the reactivity of several small, fundamental organic molecules. Not only are these molecules pollutants around our cities, but discovery of how they react in the presence of light will allow us to understand and predict the photochemistry of a much wider range of organic species.

**DP0772108** Dr BJ Kennedy

**Approved Project Title** **Cation Ordering - A Strategy to Prepare Multiferroic Oxides**

**2007 :** \$140,000

**2008 :** \$130,000

**2009 :** \$130,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

This project will produce new families of functional metal oxides with technologically relevant properties, especially multiferroic behavior. Such materials are highly sort-after in the rapidly emerging field of spintronics. Through comprehensive experimental studies of a number of such materials this project will enhance the ability of industry to develop new and improved materials.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0771664** Prof IR Kennedy; A/Prof IB Zhulin

**Approved Project Title** **Biofertiliser technology for improved yields and environmental sustainability of rice and wheat crops**

**2007 :** \$140,000

**2008 :** \$140,000

**2009 :** \$140,000

**Primary RFCD** 2703 MICROBIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

Australia faces the double challenge of improving the efficiency of its crop production while minimising the agricultural impact on its fragile biodiversity. Our project will meet this challenge by providing the technology for using natural biofertilisers in cereal crops. This will reduce our heavy reliance on chemical fertilisers - with associated soil loss, salinity and acidity, and high demand on scarce water resources - and significantly increase our crop yields. Our advances will help Australian farmers to reduce the costs and increase the productivity of our substantial export crops while improving their environmental sustainability.

**DP0772260** A/Prof TA Langrish; Dr BP Adhikari; A/Prof BR Bhandari; A/Prof T Howes

**Approved Project Title** **Surface Modification of Spray-Dried Powders By Surface-Active Proteins**

**2007 :** \$230,000

**2008 :** \$130,000

**2009 :** \$120,000

**2010 :** \$120,000

**2011 :** \$120,000

**Primary RFCD** 2901 INDUSTRIAL BIOTECHNOLOGY AND FOOD SCIENCES

ARF Dr BP Adhikari

**Administering Organisation** The University of Sydney

### Project Summary

Internal wall deposits in spray dryers lead to product degradation and pose fire hazards. This situation has limited the manufacturing of high value bio-food powders by the Australian bio-food and dairy industry, which exports 13% of the milk powder in the world. The specific economic benefits to Australia from this project arise from innovative surface modification of powder particles by proteins, development of scientific instruments and predictive tools based on Computational Fluid Dynamics (CFD). These outcomes will lead to production of free flowing powders from bio-food materials.

**DP0774173** Prof PA Lay

**Approved Project Title** **The roles of metal ions in glucose metabolism and the treatment of diabetes**

**2007 :** \$131,000

**2008 :** \$131,000

**2009 :** \$132,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

Metal supplements, such as chromium and vanadium are consumed widely for their purported fat reduction and anti-diabetic activities. However, much is still to be learnt about the efficacy and safety of such metal ions when they are taken in supplements and whether they have an essential role in the prevention of diabetes or, in some instances, are a risk factor for cancer. The research will provide an understanding of how these metal complexes exert their anti-diabetic effects and how they can be made safer and/or more efficacious for the treatment of type 2 diabetes, which is a rapidly expanding epidemic in developed countries.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772870** Prof GI Lehrer; A/Prof R Zhang  
**Approved Project Title** **Invariant theory, cellularity and geometry.**  
**2007 :** \$160,000  
**2008 :** \$137,000  
**2009 :** \$124,000  
**2010 :** \$94,000  
**2011 :** \$96,000  
**Primary RfCD** 2301 MATHEMATICS  
**Administering Organisation** The University of Sydney

### Project Summary

Mathematics underpins every aspect of people's interactions with nature (e.g. physics) and with each other (e.g. finance). Its uses range from formulating physical laws in order to understand and predict nature, to analysis of financial concepts and transactions. This project will make fundamental contributions to the mathematics of symmetry. Benefits include enhancement of Australia's position at the very frontier of world class mathematical research, and a myriad of potential applications to physics, coding theory, information technology, electronic security and experimental design.

**DP0773726** Dr Q Li; Dr RC Appleyard; Dr W Li  
**Approved Project Title** **Computational Scaffold Optimisation for Tissue Engineering**  
**2007 :** \$75,000  
**2008 :** \$70,000  
**2009 :** \$70,000  
**Primary RfCD** 2915 BIOMEDICAL ENGINEERING  
**Administering Organisation** The University of Sydney

### Project Summary

Due to exceptional potential, tissue engineering has attracted over US\$4.5 billion research and development investment and another US\$2.6 billion market capital since 1990. It is important to cement Australia's position in such a highly competitive field. This project aims to develop a novel technology for scaffold-based tissue engineering, which would help Australia lead in the relevant area and increase its competitiveness in the future global market of biomaterials, tissue products, biomedical software and instruments. An enormous socio-economic benefit to Australia would be a significant improvement in the clinical success rate for our ageing population.

**DP0772880** Dr X Liao  
**Approved Project Title** **Transmission electron microscopy investigation of the deformation mechanisms of nanostructured materials**  
**2007 :** \$300,000  
**2008 :** \$210,000  
**2009 :** \$200,000  
**2010 :** \$135,000  
**2011 :** \$135,000  
**Primary RfCD** 2918 INTERDISCIPLINARY ENGINEERING  
QEII Dr X Liao  
**Administering Organisation** The University of Sydney

### Project Summary

Structural materials with high strength and high ductility are desirable because high strength allows structural components to carry high load and high ductility is essential to prevent catastrophic failure. The combination of high strength and high ductility has never been achieved in coarse-grained materials but has been realized in some nanostructured materials. This project aims to understand the mechanisms responsible for the combined high strength and high ductility in nanostructured materials. The results obtained from this research will be very important for guiding the structural design of materials with high strength and high ductility which will find a wide range of civil and defence applications.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773977** Dr Z Liu; Prof Y Yan

**Approved Project Title** **Development of Carbon Nanotube Nanothermometers and Their Application for Temperature Measurement in the Catalytic Layers of Fuel Cells**

**2007 :** \$165,000

**2008 :** \$135,000

**2009 :** \$135,000

**2010 :** \$135,000

**2011 :** \$125,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

QEI1 Dr Z Liu

**Administering Organisation** The University of Sydney

### Project Summary

The project encompasses cutting-edge work in nanotechnology and advanced materials, covering aspects of carbon nanotubes and their applications, along with fuel cell technology. It will provide unique insights into the phenomena of the nanoworld, including manipulation of nanotubes, and nanoscale oxidation behaviour and temperature measurement. The scientific and engineering understanding acquired through this project is vital for solving the problems that limit the wide application of fuel cells. Ultimately, full commercialisation of fuel cells will provide significant environmental benefits by increasing the use of renewable energy sources and reducing greenhouse gas emissions.

**DP0774662** Dr D Lu

**Approved Project Title** **The export of Chinese architecture to the Third World; China's international role in development**

**2007 :** \$60,000

**2008 :** \$60,000

**2009 :** \$50,000

**Primary RFCD** 3101 ARCHITECTURE AND URBAN ENVIRONMENT

**Administering Organisation** The University of Sydney

### Project Summary

This project examines the global dimension of nation building through an investigation into the export of Chinese architecture to the Third World as part of its overseas aid programs between 1956 and 1989. Australia's bilateral relationship with China is one of our most important, and the overseas aid program is an important aspect of our foreign policy. This research will advance the national interest through: a substantial increase in the knowledge of China's international role in the Third World; evaluation of the cultural significance of overseas aid programs; and conceptual reformulation of the relationship between nation building and global space.

**DP0773987** A/Prof CR MacIntyre; Prof AJ Plant; Dr RE Watkins

**Approved Project Title** **Who acquires infection from whom across international borders? New approaches for control of emerging infections through understanding travel patterns**

**2007 :** \$248,000

**2008 :** \$91,000

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

**Administering Organisation** The University of Sydney

### Project Summary

Mathematical modelling of data on travellers traversing Australia's borders and their contact patterns can be used to understand the pathways by which infectious diseases enter and spread in Australia. Currently available social contact data which informs models are inadequate and outdated. Gathering new data relevant to modern society will help control future infectious disease threats to our society. Our aim is to collect detailed, unique data on demography, behavioural and social patterns of travellers and residents, and use this to develop mathematical models to evaluate effective control measures for emerging infections in Australia. This study will make a unique contribution to national disease control policy.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770253** Dr CP Marshall

**Approved Project Title** **Links Between Modern and Fossil Microbes and the Evolution of Life in Earth's Extreme Early Environments**

**2007 :** \$143,673

**2008 :** \$148,573

**2009 :** \$156,053

**2010 :** \$147,263

**2011 :** \$146,808

**Primary RFCD** 2601 GEOLOGY

QEI1 Dr CP Marshall

**Administering Organisation** The University of Sydney

### Project Summary

The quest to understand early and modern life in extreme environments tackles some of the most profound questions of humankind. The novel application of spectroscopic techniques to investigate modern and fossil microbes presents an unprecedented opportunity to establish the link between primitive living and fossil organisms, thus enriching our understanding of the early evolution of life and its interactions with Earth's early environments. The project links fundamental processes that shaped the Earth and thus fits into the National Research Priority 1: An Environmentally Sustainable Australia.

**DP0772408** Prof AR Masri; Prof RW Bilger

**Approved Project Title** **Finite Rate Chemistry Effects in Turbulent Combustion**

**2007 :** \$160,000

**2008 :** \$180,000

**2009 :** \$160,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of Sydney

### Project Summary

This proposal is closely aligned with the first national research priority of an environmentally sustainable Australia. The projects outlined here will improve the modelling of finite rate chemistry effects in turbulent flames hence providing the necessary framework for advancing the science of combustion that will ultimately lead to clean combustion technologies. Improved computational design tools that result from this research will assist Australia in meeting its obligations to the AP6 program towards the development of new energy technologies. Another important benefit of this research is the training of graduates as future combustion scientists that are highly sought after both locally and overseas.

**DP0773178** Prof AB McBratney; Dr B Minasny; Dr RA Viscarra Rossel

**Approved Project Title** **High resolution digital soil mapping**

**2007 :** \$120,000

**2008 :** \$110,000

**2009 :** \$100,000

**Primary RFCD** 3001 SOIL AND WATER SCIENCES

**Administering Organisation** The University of Sydney

### Project Summary

Soil mapping is a key part of land-resource assessment for sustainable environmental management. This project aims to build a methodology to provide a high quality digital soil maps. The output will enable the use of soil data and information to give a clear understanding of the status of, and changes in, the nation's land, vegetation and water resources and implications for their sustainable use.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770519** Dr NM McClure-Griffiths

**Approved Project Title** **Understanding the Evolution of the Milky Way**

**2007 :** \$179,893  
**2008 :** \$168,893  
**2009 :** \$124,893  
**2010 :** \$114,893  
**2011 :** \$114,893

**Primary RFCD** 2401 ASTRONOMICAL SCIENCES  
QEII Dr NM McClure-Griffiths

**Administering Organisation** The University of Sydney

### Project Summary

This research will produce stunning radio images of the Milky Way, which will help us understand the nature of our Galaxy and how it evolves. This project will capitalise on Australia's unique strengths in radio astronomy to help return Australia to the forefront of Milky Way research. The headway made on understanding the evolution of the Milky Way will be applied to understanding countless other galaxies and the Universe as a whole.

**DP0773324** Prof AM McLennan

**Approved Project Title** **'Fixed points': extending and deepening our understanding of mathematical and computational aspects of game theory**

**2007 :** \$135,000  
**2008 :** \$140,000  
**2009 :** \$145,000  
**2010 :** \$100,000  
**2011 :** \$155,000

**Primary RFCD** 3401 ECONOMIC THEORY  
APF Prof AM McLennan

**Administering Organisation** The University of Sydney

### Project Summary

This work will extend and deepen our understanding of mathematical and computational aspects of game theory. It will produce computer code embodying new methods of solving systems of nonlinear equations, which is useful in many areas of applied research in economics, in other disciplines such as chemistry, and potentially in the analysis of business operations. The project will also deepen our understanding of the underlying mathematics of such systems, and of other mathematical foundations of economic research. One application will be a new measure of the relative power resulting from voting rules. Such measures assist the design of democratic institutions by allowing the designer to assess the fairness of the outcomes they produce.

**DP0773790** Dr PA McManus; Dr GA Albrecht

**Approved Project Title** **A study of the Australian thoroughbred and racing industry and the construction of 'nature'**

**2007 :** \$75,000  
**2008 :** \$90,000  
**2009 :** \$75,000

**Primary RFCD** 3704 HUMAN GEOGRAPHY

**Administering Organisation** The University of Sydney

### Project Summary

The thoroughbred breeding and racing industry contributes significantly to national export income, regional development and national identity in Australia. Studying the physical and discursive construction and use of 'nature' (including, soil, grass, water, reproduction and the necessity of the unpredictability of nature) in different phases of breeding and racing improves understandings of technology adoption, human-animal relations, sport and nature. Research outcomes will improve our understanding of this traditionally resilient but now vulnerable industry, thereby enhancing its capacity to adapt to change and remain internationally competitive.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772080** Prof DB Melrose; Dr JR Macquart; Dr S Johnston

**Approved Project Title** **Physics of extreme brightness temperatures in radioastronomical sources**

**2007 :** \$100,000

**2008 :** \$90,000

**2009 :** \$80,000

**Primary RFCD** 2401 ASTRONOMICAL SCIENCES

**Administering Organisation** The University of Sydney

### Project Summary

Pulsars and some quasars are so very bright that the conventional explanation for radioastronomical emission from other sources either does not apply to them, or presents unsolved problems. We see (in radio waves) these sources through the interstellar medium which acts like a wrinkled pane of glass in distorting the image. New scientific ideas and methodologies are proposed here and will be explored in the project, with the objective to understand these sources and to extract information on their properties and those of the interstellar medium.

**DP0774431** Prof RA Minasian; Dr EH Chan

**Approved Project Title** **Dynamically tunable, low-noise, discrete-time optical processing of high-speed signals**

**2007 :** \$160,000

**2008 :** \$125,000

**2009 :** \$110,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

APD Dr EH Chan

**Administering Organisation** The University of Sydney

### Project Summary

In today's society there is an unrelenting push for increasing bandwidth requirements. Thus the challenge arises to provide systems that can optimally condition high-speed signals. Many systems carry not only the desired information but also high level interference signals. Tunable interference mitigation is required to address different interferers actively while having minimal impact on the passband. The new dynamically tunable photonic signal processors in this project have important applications for science, business and security services. The results have widespread uses in enhancing fibre-fed distributed antenna systems, with national benefits in the fields of radioastronomy and radar systems in defence.

**DP0773984** Dr C Monat

**Approved Project Title** **Slow light in nonlinear photonic crystals: less haste, more speed**

**2007 :** \$77,030

**2008 :** \$77,030

**2009 :** \$77,030

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

APD Dr C Monat

**Administering Organisation** The University of Sydney

### Project Summary

The development of communications is vital to Australia's future. Our project will enable both massive improvements of the performance of the communication technologies and significant reductions in the cost and size of the associated infrastructures. The resulting benefits will contribute to developing the economy and lifestyle of rural and regional Australia. The expansion of a faster network throughout the country will eventually enable advanced techniques and services such as remote surgery, remote engineering and distance education. We will provide advanced training for three students who will gain valuable skills in this area that will be sought after by the Australian information and communication technology industry.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0771274** Dr K Ostrikov  
**Approved Project Title** **Plasma nanotools: bridging plasma physics and surface science**  
**2007 :** \$94,000  
**2008 :** \$87,000  
**2009 :** \$90,000  
**Primary RFCD** 2403 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PH  
**Administering Organisation** The University of Sydney

### Project Summary

This project will herald a new frontier research area at the edge of plasma physics and surface science, secure and strengthen Australia's presence in newly emerging nanotechnology fields, reveal the superior potential of and raise the global high-tech market sentiment in plasma-aided nanofabrication of flat display panels, biosensors, nanoelectronic devices, smart nanomaterials, and other high-tech products. The outcomes will ultimately lead to new environment-friendly and cost-efficient plasma-based technologies and nanofabrication and nanotooling industries in Australia. High profile of Australia-based research will be raised via a new network of international collaborations and low-cost involvement into forefront research programs.

**DP0774133** Mr PJ O'Sullivan  
**Approved Project Title** **Categorical splitting theorems in algebraic geometry**  
**2007 :** \$77,030  
**2008 :** \$77,030  
**2009 :** \$77,030  
**Primary RFCD** 2301 MATHEMATICS  
APD Mr PJ O'Sullivan  
**Administering Organisation** The University of Sydney

### Project Summary

Algebraic geometry is the study of solutions of polynomial equations. It is one of the richest fields of Mathematics, and has led to advances in cryptography and other areas of technology. The project aims to apply in this field some recently developed abstract techniques in order to obtain results of a new type. It is also expected that the approach taken will help to simplify and unify the branches of algebraic geometry considered. Projects of a theoretical nature such as this one help to maintain Australia's high standing in the international scientific community.

**DP0773962** Prof TR Parmenter; A/Prof RJ Stancliffe; Dr MF Knox; Dr MC Donnelly  
**Approved Project Title** **Moving beyond crisis management: Creating a future for people with disabilities living with ageing parents**  
**2007 :** \$120,000  
**2008 :** \$120,000  
**2009 :** \$199,000  
**Primary RFCD** 3212 PUBLIC HEALTH AND HEALTH SERVICES  
**Administering Organisation** The University of Sydney

### Project Summary

The needs of thousands of people with disabilities being cared for by ageing parents are beyond the capacity of our existing formal mechanisms for providing care. In order to mitigate this national crisis in support, this research will establish effective, resource efficient support strategies where there are currently no plans in place for future care arrangements. By enhancing the capacity of the community to provide support the benefit of existing formal supports will be extended to address the needs of more families. This project will position Australian disability research and support at the forefront of international efforts to legitimize the claim of people with disabilities and their families on community resources.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772418** Dr BL Phillips  
**Approved Project Title** **Disperse or die: the evolution of dispersal ability in a changing climate.**  
**2007 :** \$120,000  
**2008 :** \$115,000  
**2009 :** \$97,000  
**Primary RFCD** 2707 ECOLOGY AND EVOLUTION  
APD Dr BL Phillips  
**Administering Organisation** The University of Sydney

### Project Summary

Whether or not climate change will affect a species depends upon the ability of ecological communities to track climate change. Species that rapidly shift their range in response to climate change will not be unduly affected, whereas species that are stuck in one place are at extreme risk from a changing climate (they must either adapt, or perish). We need, therefore, a firm understanding of how, and how rapidly, species shift their range. This project will develop a universal framework within which to model species' responses to climate change. As such, the project will contribute greatly to how we plan for, and manage, the effects of climate change.

**DP0770418** Prof R Pitchford  
**Approved Project Title** **Balancing the risk of harm with productivity in the mercurial firm: economic theory and applications to Australian policy.**  
**2007 :** \$115,000  
**2008 :** \$120,000  
**2009 :** \$120,000  
**2010 :** \$80,000  
**2011 :** \$125,000  
**Primary RFCD** 3401 ECONOMIC THEORY  
APF Prof R Pitchford  
**Administering Organisation** The University of Sydney

### Project Summary

Australia has had at least one significant chemical spill per month for the last 30 years. While the Longford disaster fades from the news, James Hardy's asbestos problem fills its place. This project will develop a general conceptual framework in which to analyse the economics of risky firms. The framework will be used to evaluate Australian, International, and alternative policies. The end benefit to Australia will be an improvement in policy toward firms that cause accidents.

**DP0770437** Dr M Poulos  
**Approved Project Title** **A New History of 1968: Feminism and Student Revolt in the Colonels' Greece (1967-1974)**  
**2007 :** \$59,960  
**2008 :** \$59,960  
**2009 :** \$57,773  
**2010 :** \$57,773  
**Primary RFCD** 4301 HISTORICAL STUDIES  
APD Dr M Poulos  
**Administering Organisation** The University of Sydney

### Project Summary

The student revolts of 68 are usually associated with Paris, Berkeley, Turin, Chicago, Leeds. But student uprisings also occurred in the universities of Australia, when students mobilised most notably against the Vietnam War. But there is another dimension which makes this project an important one for Australia - namely, that many Greek citizens migrated to Australia both after the Civil War (1946-1949) and after the installation of the military junta in 1967. This project will be historicising an aspect of the Australian migration experience which has received little acknowledgement.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770920** Prof CJ Pybus

**Approved Project Title** **Recovered Lives as Windows on the Anglo Colonial World, 1750-1850**

**2007 :** \$168,033  
**2008 :** \$100,652  
**2009 :** \$143,438  
**2010 :** \$89,819  
**2011 :** \$108,000

**Primary RFCD** 4301 HISTORICAL STUDIES  
APF Prof CJ Pybus

**Administering Organisation** The University of Sydney

### Project Summary

In the face of rancorous public debate about our past, there is an urgent need for dispassionate scholarship to provide a complex interpretation of Australia's early history. By considering the settlement of Australia as a process within an interconnected global empire, rather than an isolated event, the project will increase the understanding of our beginnings and inject Australian concerns into the burgeoning international scholarship on the Anglo colonial world. By complicating our understanding of race in colonial Australia, the project will challenge the prevailing historical view that Australia has always been a racially-based white society, driven by racially determined policies.

**DP0773847** Dr JR Reimers; Prof MJ Crossley; Em/Prof NS Hush

**Approved Project Title** **Principles, synthesis, and evaluation of molecular electronic devices**

**2007 :** \$320,000  
**2008 :** \$320,000  
**2009 :** \$250,000  
**2010 :** \$150,000  
**2011 :** \$150,000

**Primary RFCD** 2503 ORGANIC CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

This project is at the forefront of modern science and technology. It involves exploration of the operation and means of fabrication of devices on the nanoscale. Future advances in silicon-chip manufacture will require development of new technologies such as molecular electronics, technologies in which Australia is well placed to play a significant role. This project will generate the first method for the integration and construction of complex molecular devices on silicon with atomic control and precision, and advances in solar electricity and solar-powered hydrogen production. It provides advanced training in important areas in nanotechnology including nanoscale synthesis, measurement, and computation.

**DP0773777** Prof DR Richardson

**Approved Project Title** **The Effect of Nitrogen Monoxide on Intracellular Iron Metabolism**

**2007 :** \$132,000  
**2008 :** \$125,000  
**2009 :** \$120,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

For the first time, we discovered that nitric oxide (NO) is actively transported from cells by a protein that is known to also transport glutathione (GSH). This is important, as NO was thought to passively diffuse from cells. Active transport overcomes the problems of diffusion which is inefficient and non-targeted. Moreover, NO is released as a complex with iron and GSH which markedly increases its half-life. These findings have broad implications for understanding the activity of NO in many processes which have major health implications, including tumour cell killing by macrophages, blood pressure etc.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0774390** Dr JF Ruys

**Approved Project Title** **Learning from Life: The Creation of Experiential and Life-Long Learning in Europe in the Medieval and Early Modern Periods**

**2007 :** \$124,792

**2008 :** \$134,402

**2009 :** \$123,563

**2010 :** \$124,462

**2011 :** \$118,313

**Primary RFCD** 4202 LITERATURE STUDIES

QEI1 Dr JF Ruys

**Administering Organisation** The University of Sydney

### Project Summary

Experiential and life-long learning are fundamental principles of modern Australian educational practice, from primary and high school to university and centres of adult education; they are of interest to the Federal Government (Higher Education Review, Senate Inquiry, DEST project). This innovative project will investigate the cultural heritage of these practices, detailing how they arose in medieval Europe and were refined by thinkers and practitioners throughout the early modern period. It will reveal how a reliance on received authority and example was transformed into a modern pedagogic mode that encourages learning throughout the course of life and teaches pupils how to think for themselves and to learn from life experience.

**DP0773967** Dr AA Samarian

**Approved Project Title** **Dust Physics: a Challenge in International Thermonuclear Experimental Reactor**

**2007 :** \$159,893

**2008 :** \$149,893

**2009 :** \$129,893

**2010 :** \$114,893

**2011 :** \$114,893

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

QEI1 Dr AA Samarian

**Administering Organisation** The University of Sydney

### Project Summary

This proposal is highly relevant to development of the electricity-producing fusion power plants. The outcomes will contribute to the achievement of greater control, predictability, and cost efficiency of fusion reactors operation. The project falls within the " An Environmentally Sustainable Australia " research priority and will contribute to development of widely available energy source with essentially unlimited supply and manageable environmental impact.

**DP0772439** Dr F Seebacher

**Approved Project Title** **Genetic mechanisms of metabolic control and thermal sensing during thermoregulation**

**2007 :** \$76,000

**2008 :** \$76,000

**2009 :** \$76,000

**Primary RFCD** 2706 PHYSIOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

This research will significantly advance understanding of how animals can respond to climate change, and the results will benefit wildlife management processes. The proposed research will lead to collaboration with Prof. Ken Storey an ISI highly cited author and expert in microarray analysis. The cDNA microarray for *Crocodylus porosus* which I will construct in the proposed research will be a valuable resource for Australia by increasing collaborations, and it will help find the cause of problems prevalent in the crocodile industry such as runt animals that significantly decrease production efficiency.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0771521** Dr J Sharman

**Approved Project Title** **Following the Money: The Birth, Diffusion and Effectiveness of the Global Regime to Counter Money Laundering and Terrorist Financing**

**2007 :** \$113,000  
**2008 :** \$98,000  
**2009 :** \$107,000  
**2010 :** \$87,000  
**2011 :** \$83,000

**Primary RFCD** 3601 POLITICAL SCIENCE

QEI1 Dr J Sharman

**Administering Organisation** The University of Sydney

### Project Summary

Countering international crime and terrorism are two of the government's top priorities, and attacking the financial underpinnings of these threats is crucial to combatting both. The more knowledge generated about the design, diffusion and effectiveness of existing standards in these areas, the more successful this effort can become. Australia is more closely involved with the campaign to stop such illicit financial activity than any other country in the Asia-Pacific region. That our domestic laws and regulations are often designed by international organisations, rather than federal or state governments, is a matter of broad political significance and of community interest.

**DP0773250** Dr A Sharpe; Prof KM Refshauge; A/Prof MK Nicholas

**Approved Project Title** **The role of attention re-training in pain tolerance**

**2007 :** \$71,000  
**2008 :** \$66,000  
**2009 :** \$75,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

Chronic pain is one of the most debilitating and expensive chronic health problems in westernized countries. Chronic pain develops when an individual is injured and is fearful of the pain that they experience. This causes them to become hypervigilant to pain, avoid activity and results in a vicious cycle of increasing disability. This research has two, related aims. First, we aim to test this model to see whether hypervigilance influences response to pain, as predicted. Second, we will develop and test an intervention to reduce hypervigilance to pain in healthy people and those with acute injuries. If the intervention is successful, it will have the potential to prevent the development of chronic pain or reduce its severity.

**DP0770296** Prof R Shine

**Approved Project Title** **Toad vs Toad: Innovative approaches to understand and control an invasive species**

**2007 :** \$233,000  
**2008 :** \$218,000  
**2009 :** \$220,000  
**2010 :** \$208,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** The University of Sydney

### Project Summary

Understanding the ecology of an invasive pest species can be a powerful tool for developing control methods. Cane toads pose a major threat to Australian native species, and are spreading increasingly rapidly through the Australian tropics. Unfortunately, we still know very little about the biology of invasion-front populations of toads. This project will provide that understanding, and will explore new ideas about ways to control toad populations. For example, if we can reduce the survival of feral animals by increasing the intensity of competition within their own populations rather than relying on effects of other species, we may be able to use the toads to control their own populations.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770631** Prof CM Stampfl; Dr O Warschkow; Dr B Delley; Prof CG Van de Walle

**Approved Project Title** **First Principles Catalyst Design Towards an Environmentally Clean and Energy Efficient Future**

**2007 :** \$130,000  
**2008 :** \$100,000  
**2009 :** \$100,000

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

**Administering Organisation** The University of Sydney

### Project Summary

This Proposal will explore through first-principles calculations novel catalytic materials critical for the advancement of hydrogen production and fuel-cell performance, as a viable clean energy source. Theory and computation in forefront sciences plays a crucial role not only in understanding and guiding experiment, but in predicting new (potential) structures and processes. This project will involve collaboration with leading international experts, thus enhancing Australia's knowledge base and research capacity. This work will raise the profile of Australian-lead research, and afford a deeper integration into global research programs.

**DP0771840** Mr D Stello

**Approved Project Title** **Habitable planets and stellar oscillations with the NASA Kepler mission**

**2007 :** \$65,773  
**2008 :** \$63,773  
**2009 :** \$63,773  
**2010 :** \$57,773

**Primary RFCD** 2401 ASTRONOMICAL SCIENCES

APD Mr D Stello

**Administering Organisation** The University of Sydney

### Project Summary

This project will ensure Australia's participation in a large space mission, which will detect habitable planets, like our own, around stars. We will build strong links to leading international institutions, supply high-level training for students in information processing skills, and develop new techniques for data analysis that are directly relevant to future space missions. This will position Australia in space exploration, with potential spin-offs for Australian industry. The science of this project will lead to a breakthrough in our understanding of the structure and evolution of stars and their planets, which will enhance Australia's reputation in these two fields of research.

**DP0774507** Prof PR Stopher

**Approved Project Title** **Developing Tour Based Models for an Integrated Land Use, Transport and Environment Model System for Australia**

**2007 :** \$62,000  
**2008 :** \$66,000  
**2009 :** \$79,000

**Primary RFCD** 3504 TRANSPORTATION

**Administering Organisation** The University of Sydney

### Project Summary

Land use activity and transport provision represent important facets of the Australian economy (e.g., transport activities represent 17% of the total national gross domestic product). This project will improve significantly the ability of policy makers to make better and timely judgments about the virtues of specific land use and transport planning outcomes. The behavioural models to be developed will allow for greater sensitivity analysis to policy scenario planning, with measured impacts including forecasts of traffic levels and environmental impacts, especially greenhouse gas emissions and energy requirements.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773011** Dr CJ Sumbly  
**Approved Project Title** **Anion Binding and Sensing With Self-Assembled Metallo-Supramolecular Assemblies**  
**2007 :** \$92,030  
**2008 :** \$87,030  
**2009 :** \$87,030  
**Primary RFCD** 2599 OTHER CHEMICAL SCIENCES  
APD Dr CJ Sumbly  
**Administering Organisation** The University of Sydney

### Project Summary

Anions are of particular significance in several areas relating to the day-to-day lives of Australians; for example as contaminants in waterways and nuclear waste streams, as indicators of chemical weapons, and as antagonists in biological systems. The proposed research programme will investigate a relatively unexplored approach to binding and sensing anions. This will further research in the area of supramolecular chemistry, providing additional research expertise in this rapidly progressing area of the chemical sciences. In terms of Breakthrough science the targeted assemblies will shed further light on self-assembly processes involving ligands with different domains, placing Australian research at the forefront of such investigations.

**DP0771339** Prof RI Tanner  
**Approved Project Title** **Mullins-type effects in soft filled viscoelastic solids**  
**2007 :** \$89,938  
**2008 :** \$93,809  
**2009 :** \$97,238  
**Primary RFCD** 2901 INDUSTRIAL BIOTECHNOLOGY AND FOOD SCIENCES  
**Administering Organisation** The University of Sydney

### Project Summary

Bread dough is made in vast quantities daily, and improvements in processing, especially sheet rolling, are needed, and to enable this we propose to create a novel mathematical description of the material. Also, wheat breeding cycles can be drastically shortened by using knowledge of dough rheology, since baking quality is closely linked to rheology. The mathematical framework can then be applied to other filled viscoelastic systems, and work on liquid crystals may be used to develop artificial muscle material, once their rheological description and behaviour are known.

**DP0774596** Prof L Tong  
**Approved Project Title** **Morphing flexible structures with lead lanthanum zirconium titanate (PLZT) based optical actuators**  
**2007 :** \$112,450  
**2008 :** \$119,214  
**2009 :** \$120,278  
**Primary RFCD** 2902 AEROSPACE ENGINEERING  
**Administering Organisation** The University of Sydney

### Project Summary

Lead lanthanum zirconate titanate (PLZT) materials yield mechanical strains when exposed to near ultraviolet light as a result of combined photovoltaic and converse piezoelectric effects. They offer actuation strain on par with piezoelectric materials and other advantages, such as wireless light-to-mechanical energy transfer, immunity from electrical and magnetic disturbances and fast response with the transparent electrode design. This project aims to pioneer the application of PLZT optical actuators in morphing flexible structures leading to development of wireless smart structures technology and opt-electromechanical systems such as medical instruments.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770321** Prof J Trewhella

**Approved Project Title** **Studies of the Dynamic Language of Bio-Molecular Communication and Signalling**

**2007 :** \$150,000

**2008 :** \$120,000

**2009 :** \$120,000

**Primary RFCD** 2505 MACROMOLECULAR CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

For normal biological function, a multitude of external signals must be interpreted and responded to by cells. The responses must be carefully regulated and coordinated, or else pathological conditions will develop and, if not corrected, lead to uncontrolled proliferation or cell death. This project studies the mechanisms by which cells transmit signals. Proteins accomplish this communication by modifying the interactions among their functional domains, effectively creating a conformational language. Knowledge of this language will impact biomedicine through its contributions to understanding the molecular pathology of diseased states, and biotechnology by enhancing our ability to use biological processes for applications.

**DP0770729** Dr PG Tuthill

**Approved Project Title** **DRAGONFLY: A revolutionary instrument for astronomical imaging**

**2007 :** \$117,446

**2008 :** \$112,446

**2009 :** \$122,446

**2010 :** \$72,446

**2011 :** \$72,446

**Primary RFCD** 2401 ASTRONOMICAL SCIENCES

QEI Dr PG Tuthill

**Administering Organisation** The University of Sydney

### Project Summary

The vast distances in the galaxy have motivated the long-held dream of astronomers to build telescopes with enough magnification to zoom in on the intimate lives of stars. With a bold new approach, the Dragonfly instrument will make a major step in performance beyond existing technology, delivering images with an unmatched combination of high fidelity and resolution. A number of crucial questions await such a breakthrough in capability. How do stars form? What happens as they die? Are planetary systems common? Demonstrated success with this instrument will place it at the forefront of astronomical imaging worldwide, providing a vital element in the case for justifying the next generation of large telescopes.

**DP0773173** Prof B Vucetic; Prof VG Oklobdzija; A/Prof X Tao

**Approved Project Title** **Design and Implementation of Ultra-Low Power Cooperative Communication Terminals**

**2007 :** \$107,000

**2008 :** \$107,000

**2009 :** \$107,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Sydney

### Project Summary

Low power consumption is one of the most critical issues for wide deployment of wireless sensor networks and implementation of 4G communication systems. In the proposed project we will devise novel ultra-low power signal processing and hardware design techniques enabling a significant advance in wireless communication technology. The novel algorithms can be applied in home networks, irrigation in agriculture, environment monitoring and 4G wireless communication systems.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0772881** Dr Q Wang; Prof J Robinson; Prof NC Weber

**Approved Project Title** **Asymptotic Expansions and Large Deviations in Probability and Statistics: Theory and Applications**

**2007 :** \$153,614

**2008 :** \$123,614

**2009 :** \$113,614

**2010 :** \$136,614

**2011 :** \$136,614

**Primary RFCD** 2302 STATISTICS

ARF Dr Q Wang

**Administering Organisation** The University of Sydney

### Project Summary

Statistics is the major enabling science in a number of disciplines. This is fundamental research in probability and statistics but it has wide applications in Biology and Social Sciences which will ultimately be of national benefit. The behaviour of self normalized sums is an exciting new area of fundamental research that has implications for the application of statistics in many areas. U-statistics for dependent situations has direct application to understanding financial time series and the analysis of sample survey data. Saddlepoint methods provide extremely accurate approximations in a number of important applications.

**DP0774289** Prof AS Weiss; Prof CM Kielty

**Approved Project Title** **Biochemistry of tropoelastin and elastin: the molecular architecture of elastic fibre assembly**

**2007 :** \$100,000

**2008 :** \$100,000

**2009 :** \$95,000

**Primary RFCD** 2505 MACROMOLECULAR CHEMISTRY

**Administering Organisation** The University of Sydney

### Project Summary

Elastin destruction drives the progression of emphysema, a major component of chronic obstructive pulmonary disease which is a major cause of death. Loss of elastin leads to profound blockage of arteries. If we are to treat these problems we need to know how to make and repair elastin. This research will enable us to discover how elastin is constructed and define its interacting partners. We will learn how to make tissue components found in parts of the body that expand and contract such as the arteries, lung and skin. We will learn about the molecular mechanisms of elastin assembly and cell interactions, which gives us the core molecular toolkit to repair elastin tissue.

**DP0773812** A/Prof AR Welch; Dr R Yang

**Approved Project Title** **The Chinese Knowledge Diaspora and the International Knowledge Network - Australian and Canadian Universities Compared**

**2007 :** \$60,134

**2008 :** \$74,784

**2009 :** \$58,264

**Primary RFCD** 3301 EDUCATION STUDIES

**Administering Organisation** The University of Sydney

### Project Summary

For Australia, one of the key contemporary challenges is to understand China, in ways that maximise mutual benefits. This includes the key arena of education, where the growing number of Chinese intellectuals working in Australian (and Canadian) universities, can assist in replenishing an ageing domestic academic work force, as well as forging international research networks. The bi-cultural, bi-lingual expertise of this Chinese knowledge diaspora constitutes a key resource with which to build trans-national research and knowledge networks, with the diverse and growing Chinese scholarly community, worldwide. The advantages, prospects and difficulties of such trans-national networks are explained.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0773994** A/Prof LM Williams

**Approved Project Title** Identifying risk markers for depression: A cognitive neuroscience approach

**2007 :** \$130,587

**2008 :** \$185,333

**2009 :** \$90,347

**2010 :** \$145,640

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Sydney

### Project Summary

This project will establish objective markers for detecting early signs of depression. These markers are crucial in enabling early intervention to limit the course of depression. They will also benefit the development of prevention strategies, since they provide a means to identify high risk individuals. Currently there exists no simple and objective test or set of markers that can detect the early signs of depression. The available tests provide information relevant to the later-stage of clinical depression only. In this regard, non-invasive and objective markers are urgently required to limit the burden of depression. In Australia, \$3.3 billion in productivity and 12 million working days are lost each year as a result of depression.

**DP0770395** Dr JY Yang

**Approved Project Title** Statistical methods and tools for integrative microarray analysis

**2007 :** \$89,000

**2008 :** \$84,000

**2009 :** \$82,000

**Primary RFCD** 2302 STATISTICS

**Administering Organisation** The University of Sydney

### Project Summary

Tools used for biological and medical research have been evolving and there has been an increase in high-throughput technologies such as genome sequencing and DNA microarray. The growing number of entries and the increasing availability of public microarray repositories and other sequence databases have generated the new challenge of developing tools to efficiently integrate data by different research groups. This research provides new statistical methods to integrate different data sets. Its application in the biomedical field will allow researchers to effectively interpret the myriad of data generated within the community.

**DP0773123** Prof L Zhang; Dr I Zarudi; A/Prof W Gao; Dr Y Gu

**Approved Project Title** Damage-Free Surfacing of Large Brittle Wafers with On-Machine Flatness Control

**2007 :** \$267,664

**2008 :** \$287,748

**2009 :** \$247,470

**2010 :** \$200,000

**2011 :** \$200,000

**Primary RFCD** 2903 MANUFACTURING ENGINEERING

**Administering Organisation** The University of Sydney

### Project Summary

The knowledge gained from this research project will be of great value to the development of new generations of high-integrity semiconductor systems for high-speed telecommunication, large-scale computation, transport, biomedicine, agriculture, mining and security. The outcomes will have significant impact on the ultra-precision discipline scientifically and will sharpen the competitive edge of the Australian fabrication industry. The research will open up remarkable opportunities for young researchers to work in one of the most frontier fields in the 21st century.

## Summary of Discovery Projects Proposals for Funding to Commence in 2007

**DP0770987** Dr R Zheng

**Approved Project Title** **Microscopic Origin of Ferromagnetism of Diluted Magnetic Demiconductors**

**2007 :** \$180,614  
**2008 :** \$171,614  
**2009 :** \$171,614  
**2010 :** \$96,614  
**2011 :** \$96,614

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

ARF Dr R Zheng

**Administering Organisation** The University of Sydney

### Project Summary

Spintronics based on the spin in addition to the charge of electrons is believed to revolutionize current microelectronics, which is approaching the end of the so-called silicon road map. Diluted magnetic semiconductors are required to achieve spintronics, just as silicon in microelectronics. This project aims to understand the microscopic origin of ferromagnetism of diluted magnetic semiconductors - a major obstacle towards spintronics. This research, addressing an important problem in breakthrough science and frontier technologies, will not only expand Australia's knowledge base and research capability, but also help to build Australia's high value-added industries.