

New South Wales

The University of Sydney

DP0985845 Prof WH Anderson; Dr RL Jones

Approved Project Title **Anatomies of Empire: Race, Evolution and Scientific Networks in the Twentieth-Century British World**

2009 : \$ 120,000

2010 : \$ 110,000

2011 : \$ 90,000

Primary RFCD 4301 HISTORICAL STUDIES

APD Dr RL Jones

Administering Organisation The University of Sydney

Project Summary

Our research demonstrates how Australian scientists, Australian field experiences, and Australian materials were central to comparative anatomy, evolutionary theory and race science in the twentieth century. This study uncovers for the first time the powerful imperial network of racial biologists and physical anthropologists whose influential studies of human nature and racial classification derived from Australian work. These ideas about what it means to be human, hitherto unexamined historically, continue to underpin our contemporary assumptions about ethnic difference, Aboriginal status, multiculturalism, and national identity.

DP0988402 Prof SW Armfield; Dr MP Kirkpatrick; Dr W Lin

Approved Project Title **Investigation and optimisation of displacement ventilation and cooling systems**

2009 : \$ 75,000

2010 : \$ 75,000

2011 : \$ 75,000

2012 : \$ 75,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Organisation The University of Sydney

Project Summary

An accurate optimisation design tool for cooling and ventilation will be of considerable benefit to the Australian building/construction industry, and will lead to a reduction in energy consumption, thereby reducing both consumer costs and Australia's total greenhouse gas output, as well as providing Australian industry with a competitive advantage. Turbulence modelling for stratified fluids is one of the grand challenge areas of science, and graduate students and postdoctoral researchers trained in this area will be well placed to make a significant contribution to the new technologies needed to address the major environmental problems currently being faced.

DP0989020 Prof GW Barton; Dr X Fan

Approved Project Title **Numerically Robust Extruder Die Design for Fabricating High-Quality Preforms for Microstructured Polymer Optical Fibres**

2009 : \$ 145,000

2010 : \$ 125,000

2011 : \$ 135,000

Primary RFCD 2804 COMPUTATION THEORY AND MATHEMATICS

Administering Organisation The University of Sydney

Project Summary

Microstructural polymer optical fibres (mPOFs) were pioneered in Australia, are now comparable in performance (but much more versatile) than conventional polymer fibre, and are a highly attractive commercial option. Potential industrial applications envisage cost-effective preform fabrication as a key issue, with extrusion as the favoured route. This interdisciplinary project benefits Australia by (i) extending and exploiting our research advantages in advanced photonics and computational rheology, (ii) providing the 'missing link' for large-scale mPOF production and positioning us to reap the economic benefits of this innovative technology, and (iii) providing computational techniques for rheological modelling that are applicable in diverse Australian industry sectors.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984518 A/Prof AC Bashford; Dr J McAdam; Dr SS Amrith

Approved Project Title **Immigration Restriction and the Racial State, c. 1880 to the present**

2009 : \$ 95,000

2010 : \$ 120,000

2011 : \$ 78,000

2012 : \$ 50,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Sydney

Project Summary

Legislating the specific criteria by which people are refused entry into sovereign territory has posed critical problems for policy and law from the late nineteenth century to the present day. By analysing the long history of medico-legal border control in the Asia-Pacific region, the project will uncover previously forgotten legal and policy links and will analyse a history of mutual influence between Australia and neighbouring nations. This will productively assist a policy environment (both national and international) primed for ever more intense border control.

DP0984232 Prof RC Baxter

Approved Project Title **How IGFBP-3 improves cancer cell responsiveness to DNA-damaging therapies**

2009 : \$ 160,000

2010 : \$ 160,000

2011 : \$ 160,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Sydney

Project Summary

A protein called IGFBP-3 can modulate the way cancer cells respond to treatments such as radiotherapy and certain chemotherapy drugs. These therapies, which act by damaging cells' DNA, play an important role in the treatment of many cancers, but their effectiveness is limited by the ability of cells to oppose the treatment by repairing damaged DNA. This project aims to discover how IGFBP-3 acts to change cancer cells' response to treatment, using breast cancer cells growing in culture as a model system. This work has the potential to lead to improvements in the treatment of cancer patients by increasing our understanding of what happens when cancer cells are exposed to radio- or chemotherapy.

DP0984731 A/Prof M Beekman; Dr MR Myerscough

Approved Project Title **House hunting honey bees: speed-accuracy trade-offs in collective decision-making**

2009 : \$ 114,000

2010 : \$ 108,000

2011 : \$ 108,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The University of Sydney

Project Summary

This project will uncover the mechanisms that underlie the trade-off between speed and accuracy in collective decision-making. We will study two species of honey bee that differ in the relative importance of speed and accuracy when deciding on a new home. Natural selection has shaped the decision-making process differently in the two species, one favouring speed, the other accuracy. We will use the natural wisdom evolved by the bees to design new mathematical models of collective decision-making. These can be applied to create efficient decision-making tools that will be useful for any large organization.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987239 Prof BJ Bennett; Prof TR Carney

Approved Project Title **Legal and Ethical Preparedness for Pandemic Influenza**

2009 : \$ 120,000

2010 : \$ 150,000

2011 : \$ 160,000

Primary RFCD 3901 LAW

Administering Organisation The University of Sydney

Project Summary

Over 40 million people in the world died in the 1918 Influenza pandemic. Any repetition could have devastating social and economic costs for Australia and the Region. Community confidence in quarantine or other restrictions in the medical management of pandemics depends on balancing protection of public health against the rights of citizens to go about their work and daily lives. By studying the adequacy of existing human pandemic influenza planning in Australia and the Asian region, this project will contribute to law reform and policy development needed to command community confidence in the ethical and public policy balances embodied in national pandemic plans, and the laws and practices which support them.

DP0988751 Prof J Bland-Hawthorn; Prof KC Freeman; Dr SC Keller; Prof M Asplund

Approved Project Title **Galactic Archaeology: a Challenge for the Cold Dark Matter Paradigm**

2009 : \$ 170,000

2010 : \$ 170,000

2011 : \$ 170,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Organisation The University of Sydney

Project Summary

Our proposal capitalizes on Australia's technological leadership in carrying out wide-field surveys, and on Australia's intellectual leadership in stellar astronomy and galactic archaeology. HERMES is the new Anglo-Australian Telescope instrument that will keep Australians competitive in a field that is set to explode in the coming decade. HERMES will provide a revolutionary dataset that has a stunning synergy with the European Space Agency's billion-dollar GAIA mission and with SkyMapper, the other Australian optical facility soon to come on line. Our proposal aims to leverage the Australian investment in HERMES and SkyMapper and in the existing Australian facility AAOmega to derive the maximum amount of science from this investment, both by us and other HERMES/SkyMapper users.

DP0986224 Prof A Bundy; Dame GA Naughton; Dr PJ Tranter; Dr SR Wyver; Prof LA Baur; Prof WE Schiller; Prof A Bauman

Approved Project Title **Popping the Bubblewrap, Unleashing the Power of Play**

2009 : \$ 175,923

2010 : \$ 102,000

2011 : \$ 121,000

Primary RFCD 3212 PUBLIC HEALTH AND HEALTH SERVICES

Administering Organisation The University of Sydney

Project Summary

The long-term costs of childhood obesity, bullying and poor mental health are staggering. Despite the investment of billions of dollars for prevention and intervention, the statistics continue to worsen. We offer a simple, sustainable, cost-effective programme of prevention aimed at important national priorities within health and research. We expect to demonstrate a significant effect on children's activity levels, coping and social skills through strategies that are replicable in every school playground in the nation and to contribute to policy regarding play, health, and education.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0986372 A/Prof DA Carter; Dr J Slapeta

Approved Project Title **Chromera velia - a new organism for understanding malaria and related parasitic diseases**

2009 : \$ 110,000

2010 : \$ 90,000

2011 : \$ 90,000

Primary RFCD 3204 MEDICAL MICROBIOLOGY

Administering Organisation The University of Sydney

Project Summary

Malaria and related parasitic diseases cause millions of deaths annually. *Chromera velia* is a recently discovered organism that was isolated from Australian corals and is the closest known relative to these parasites. *Chromera* is able to photosynthesis and live in the absence of a host, making it an excellent organism for developing antimalarial drugs. In this project we will determine key features of *Chromera* ecology, morphology, genetics and biochemistry. The resulting data will allow us to exploit *Chromera* as a model for developing anti-parasitic drugs and for understanding parasite evolution.

DP0986770 Prof JS Castles

Approved Project Title **Social transformation and international migration in the 21st century**

2009 : \$ 88,000

2010 : \$ 90,000

2011 : \$ 90,000

2012 : \$ 90,000

2013 : \$ 90,000

Primary RFCD 3701 SOCIOLOGY

Administering Organisation The University of Sydney

Project Summary

Understanding the factors that shape international migration is crucial for Australia, because planned immigration remains a cornerstone of policy, yet traditional assumptions on the predominance of permanent settlement and the geographical controllability of movement are losing their validity. This project will help create the social scientific tools for new approaches to understanding migration and diversity at the global, regional and national levels. It will help Australian governments and civil society address new challenges in this field. It will also contribute to developing a highly-trained workforce for fundamental research on migration and social transformation.

DP0986608 Dr DA Chaikin; A/Prof JC Sharman

Approved Project Title **The Nexus between Corruption and Money Laundering: Typologies and Policy Responses**

2009 : \$ 100,000

2010 : \$ 50,000

2011 : \$ 50,000

Primary RFCD 3602 POLICY AND ADMINISTRATION

Administering Organisation The University of Sydney

Project Summary

Australia has sought to take a major role in fighting corruption and money laundering, an aspiration that requires a thorough knowledge of each problem as well as the links between them. Corruption has contributed to political instability, state failure and economic underdevelopment in our region. The fight against international money laundering is a central part of safeguarding Australia from transnational crime. Our findings on the links between corruption and money laundering, and our suite of typologies, will assist Australian federal and state governments as well as businesses, to prevent and combat both types of crime.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985367 Prof H Chan

Approved Project Title **Development of a novel process for the formation of particles with controlled surface architecture for respiratory drug delivery**

2009 : \$ 140,000

2010 : \$ 110,000

2011 : \$ 110,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Organisation The University of Sydney

Project Summary

A successful conclusion of this project will enhance substantially the competitiveness of Australia's research in functional nanomaterials and advanced biomaterials. The Australian pharmaceutical industry will gain through the ability to develop proprietary pharmaceutical formulations targeted towards taking advantage of the novel process. Patients of asthma, lung infection and other serious health problems will benefit from an improved delivery of therapeutic dose at a much reduced cost. The technology is environmentally friendly as powder aerosol delivery does not require any harmful organic solvent to operate.

DP0987072 Dr S Chatterjee; Prof BM Gaensler

Approved Project Title **Snap, Crackle, Pop: Opening the Window on the Variable Radio Universe**

2009 : \$ 190,000

2010 : \$ 190,000

2011 : \$ 170,000

2012 : \$ 166,000

2013 : \$ 160,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

QEII Dr S Chatterjee

Administering Organisation The University of Sydney

Project Summary

Time variability is a frontier of discovery in astronomy. We will conduct a comprehensive set of surveys with new radio telescopes and instruments in order to build a full census of bursts, pulses, and flickers in the radio sky. Coupled with rapid follow up observations in the optical, X-ray and gamma-ray bands, these surveys will allow us to probe fundamental physics behind violent and unpredictable behaviour in the Universe. Our techniques, pipelines, and algorithms will serve as stepping stones for future experiments, and will also have wide applicability to searches for weak signals in noisy data in areas including physics, ecology, medical science, and economics.

DP0986581 Dr M Chen; A/Prof RD Willows; Prof AW Larkum; Prof RE Blankenship

Approved Project Title **Molecular mechanisms of spectral extension in photosynthesis: the substitution and formation of the novel pigment chlorophyll d**

2009 : \$ 110,000

2010 : \$ 90,000

2011 : \$ 90,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Sydney

Project Summary

This project builds on new discoveries of novel chlorophylls and how their spectral properties are fine-tuned in photosynthetic bacteria. We will focus on how key photopigments, the chlorophylls, are biosynthesised, including their enzyme structures, mechanisms and regulatory elements. Understanding the power of natural selection on spectral extension in photosynthesis will shed light on the evolutionary development of photopigments, and will allow us explore the possibilities for the production of new pigments in solar energy research.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0988311 Prof MJ Davies

Approved Project Title **Mechanisms and consequences of myeloperoxidase-mediated damage to glycosaminoglycans, proteins and proteoglycans**

2009 : \$ 170,000

2010 : \$ 170,000

2011 : \$ 180,000

2012 : \$ 170,000

2013 : \$ 180,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

APF Prof MJ Davies

Administering Organisation The University of Sydney

Project Summary

Atherosclerosis (hardening of the arteries) is responsible for the death of 40% of the population of developed, and developing, countries including Australia. Rupture of the fibrous cap of atherosclerotic lesions is responsible for most sudden deaths from heart disease and strokes, but is a poorly understood process. Evidence has been presented for a role for oxidation reactions in weakening the structure of lesions and making them prone to rupture. Little is known about the fundamental chemistry of such damage; this will be addressed in the proposed program. The data obtained will underpin the development of new preventative and protective strategies to minimise lesion rupture and deaths from this major disease.

DP0988545 A/Prof F Dehghani; Prof S Kazarian; Asst Prof A Khademhosseini

Approved Project Title **Benign fabrication of microfluidic hydrogel for improved artificial vasculature in bone implants**

2009 : \$ 120,000

2010 : \$ 110,000

2011 : \$ 100,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Organisation The University of Sydney

Project Summary

We will create a benign technology for synthesising microfluidic hydrogels to generate artificial vasculatures in bone implants. It is a critical step to enable the use of tissue-engineered vital organs, such as bone, heart and kidney in patients with end-stage organ failure. Thicker scaffolds will be possible, as the vasculature will provide nutrients and oxygen for cells to grow into 3D scaffolds. It will promote capacity of Australia for manufacturing global biomaterial products for tissue engineering. We will also develop in-situ imaging analytical protocols for the rapid analysis of broad arrays of functional molecules, with significant bearing on BioMEMS design to develop methods for diagnosis of fatal diseases.

DP0988535 Prof CR Dickman

Approved Project Title **The renaissance predator: complex predator-prey interactions and vertebrate diversity in arid Australia**

2009 : \$ 250,000

2010 : \$ 200,000

2011 : \$ 210,000

2012 : \$ 210,000

2013 : \$ 210,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APF Prof CR Dickman

Administering Organisation The University of Sydney

Project Summary

This project will greatly increase understanding of how predators influence the ecology and diversity of their prey in Australia's deserts, and thus improve our ability to conserve and manage our iconic but fragile inland landscapes. It will increase awareness locally about the richness of desert life and stimulate national and international interest by contributing to emerging debate about how predators influence diversity. It will also establish an unparalleled 24-year time series of ecological data, and thus provide a key resource to chart the biological effects of climate change and assist sustainable management of biodiversity across the continent's vast interior.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985082 Dr TE Doelman; Dr P Jia
Approved Project Title **Crossing Borders: The Use and Distribution of Volcanic Glass Artefacts in Northeast Asia**
2009 : \$ 95,000
2010 : \$ 40,000
Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY
Administering Organisation The University of Sydney

Project Summary

Our project contextualises the development and nature of exchange relationships across vast areas and potentially different peoples in order to maintain sustainable and successful life-ways in prehistory. Tracing the distribution of volcanic glass artefacts from Paektusan Volcano, located on the border of China and N.Korea, into Far East Russia and S.Korea provides insights into the rapid colonisation of northeast Asia and Northern America during the Late Palaeolithic and brings Australia to the forefront of new international areas of research. Through its collaborative nature this project will broaden our contact with China on an academic level; gaining a better appreciation of cultural, economic and political issues in the region.

DP0984223 Dr CA Driscoll; Dr K Bowles; Prof K Darian-Smith; A/Prof CR Gibson; Dr D Nichols; A/Prof G Waitt
Approved Project Title **Cultural sustainability in Australian country towns: amenity, mobility, and everyday life**
2009 : \$ 97,000
2010 : \$ 68,486
2011 : \$ 158,000
Primary RFCD 4203 CULTURAL STUDIES
Administering Organisation The University of Sydney

Project Summary

By exploring the everyday experiences of culture and cultural amenity in three country towns, this cross-disciplinary project provides the first comprehensive documentation of the complexity of cultural sustainability within rural Australia. We will explore issues of demographic mobility; individual and community relationships to places and histories; social and economic adaptability to local, national and global cultural influences; and the role of cultural infrastructure and heritage in community well-being and sustainability. Project outcomes include scholarly publications and presentations; a series of community-driven digital cultural maps; and feedback for community and government on the impact of culture on sustainability.

DP0988838 Prof PD Eades; Dr S Hong
Approved Project Title **Scalable Visual Analytics for Uncertain Dynamic Networks**
2009 : \$ 85,000
2010 : \$ 88,000
2011 : \$ 90,000
Primary RFCD 2804 COMPUTATION THEORY AND MATHEMATICS
Administering Organisation The University of Sydney

Project Summary

Technological advances have provided a data deluge over the past few years, and have led to many large uncertain and dynamic network models. This includes terrorist networks, marketing networks, facebook networks, various biological networks, and software engineering structures. Human understanding of such networks is difficult. This project aims to provide new methods for visual analysis of large uncertain dynamic networks such as these. The algorithms developed in the project will help security analysts to monitor illegal behaviour such as money laundering and terrorist activities, help biologists understand key biological systems, and help engineers to understand large software systems.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0986876 A/Prof I Einav; A/Prof A Tordesillas

Approved Project Title **Confined comminution and particle flow: a general model for large-scale canonical solutions**

2009 : \$ 150,000

2010 : \$ 120,000

2011 : \$ 120,000

Primary RFCD 2907 RESOURCES ENGINEERING

Administering Organisation The University of Sydney

Project Summary

The project integrates recent advances in continuum mechanics to develop a novel theory of comminution for large-scale problems of grain-size reduction, beyond the reach of particle-based simulations. We will deliver new knowledge and predictive tools by solving fundamental and significant comminution problems. Underpinning this development will be a direct link between energy and particle kinematics. This unique methodology will enable the prediction of energy flow in fault zones, and energy losses from machine to particle and between particles.

DP0987012 Dr C Enemark; Dr MJ Selgelid

Approved Project Title **Infectious diseases, security and ethics**

2009 : \$ 90,000

2010 : \$ 90,000

2011 : \$ 80,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Organisation The University of Sydney

Project Summary

This project will benefit the nation directly by promoting greater understanding within the community of the national security and ethical implications of infectious disease threats; recommending policies for responding in ways that achieve better public health, national security and human rights outcomes for Australians; helping to strengthen Australia's social and economic fabric; and creating national and international linkages between academics, PhD students and non-academic professionals.

DP0987763 Prof BD Fazekas de St Groth; Prof W Weninger

Approved Project Title **Real-time imaging of the initiation of adaptive immunity in vivo**

2009 : \$ 160,000

2010 : \$ 160,000

2011 : \$ 160,000

Primary RFCD 3202 IMMUNOLOGY

Administering Organisation The University of Sydney

Project Summary

Understanding the first few hours of an immune response is fundamental to understanding how the human immune system functions. The immune system mounts our responses to infectious diseases, but can also cause autoimmune disease, allergy, and organ graft rejection. We will study how naive antigen-specific T cells first contact antigen in lymph nodes using 2-photon intravital microscopy. The research has the potential to change the way we think about the clonal selection of lymphocytes, the fundamental theory underlying our understanding of the immune system.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987900 Dr AD Fekete; Dr U Roehm

Approved Project Title **Escaping the concurrency trade-off: a new approach to enterprise software**

2009 : \$ 130,000

2010 : \$ 70,000

2011 : \$ 70,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Organisation The University of Sydney

Project Summary

Enterprise software manages the operations of all business and government organisations. Designers of this often rely on their intuition or luck, by using high-performance database facilities whose correctness is not guaranteed. This project will show designers how to use these facilities while still having the assurance that the data will not be corrupted. This will improve the quality of the data used by Australian enterprises, and thus improve their operations. Australian software designers will also benefit, as they will be able to produce software that combines high performance with assurance that concurrency errors will not occur.

DP0988743 Dr T Ferenci; Prof PR Reeves; Prof L Wang

Approved Project Title **Variation in bacterial genomic mutation rates**

2009 : \$ 130,000

2010 : \$ 100,000

2011 : \$ 100,000

Primary RFCD 2703 MICROBIOLOGY

Administering Organisation The University of Sydney

Project Summary

Our measurement of global mutation rates will contribute to an understanding of the evolutionary properties of bacteria, the most diverse and successful organisms in the biosphere. Bacterial variation and culture richness contributes not only to ecological processes but also to emerging diseases. The studies will enhance capabilities essential in interpreting the evolution of epidemics and the kinetics of bacterial sweeps in nature. Variation also provides the source material for exploitation of bacterial products such as antibiotics. The results from understanding a complete set of mutational changes through genomic analysis will provide the most direct estimates of variation in evolving bacteria.

DP0985375 Dr M Fillios

Approved Project Title **The Taphonomy of Waterhole Faunal Death Assemblages: A model for Archaeological Contexts in the Australian Semi-Arid Zone**

2009 : \$ 78,978

2010 : \$ 95,000

2011 : \$ 95,000

2012 : \$ 67,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APD Dr M Fillios

Administering Organisation The University of Sydney

Project Summary

The fossil record provides key insights into factors governing the long term survival and distribution of animal populations. As people and climate change have been implicated in the reconfiguration of species' habitats through time, the fossil record has direct relevance to current issues of modern faunal extinctions and biodiversity. Robust interpretative frameworks developed in this study will provide an essential foundation to the investigation and understanding of past populations and environment.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0986237 Prof SC Fleming

Approved Project Title **Compact Tunable Visible Lasers - New Approaches to Phase-Matching**

2009 : \$ 170,000

2010 : \$ 120,000

2011 : \$ 120,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Organisation The University of Sydney

Project Summary

Australia will benefit significantly from this innovation in lasers and especially fibre lasers. Optical fibre devices are a major area of our capability in world-leading research and commercialisation. Through commercialisation we will directly benefit economically in terms of exports and jobs. We will also benefit from commercial exploitation of applications in biomedicine, security and environmental monitoring. Students will be trained in an area important for Australian research and high technology industry. Australia's position as a world-leader in optics and photonics will be strengthened .

DP0988123 Prof PR Freebody; Prof JR Martin; Dr KA Maton

Approved Project Title **Disciplinary, knowledge and schooling: Analysing and improving integrated, cumulative learning in classrooms.**

2009 : \$ 150,000

2010 : \$ 130,000

2011 : \$ 80,000

Primary RFCD 3302 CURRICULUM STUDIES

Administering Organisation The University of Sydney

Project Summary

For Australia to enhance its educational and professional standing, it needs growing levels of intellectual expertise and flexibility among school graduates, who now operate in workplaces that are rapidly evolving intellectually and technologically. This project will contribute to research, debate, and practice, by focusing on sustained integrated knowledge-building, but it also aims to offer practitioners and authorities an enhanced, locally-grown evidence for educational decisions, practice, and policy. While the motivations for the project are theoretical, professional, and methodological, they arise from a recognition of the economic and cultural importance of intellectually strong citizens in an increasingly demanding global setting.

DP0986188 A/Prof I Gardner; A/Prof J BeDuhn; Mr P Dilley

Approved Project Title **The digital restoration of the Dublin Kephalaia codex and its importance for the history of religions**

2009 : \$ 100,000

2010 : \$ 80,000

2011 : \$ 80,000

2012 : \$ 100,000

Primary RFCD 4402 RELIGION AND RELIGIOUS TRADITIONS

APD Mr P Dilley

Administering Organisation The University of Sydney

Project Summary

This is a project at the forefront of the emerging use of digital technology to render legible manuscripts long regarded as unreadable. The unique fourth century codex, now housed at the Chester Beatty Library in Dublin Castle, has been known of since 1929. The latest developments in image enhancement, especially the pseudocolour technique, offer the first chance for an international team led from the University of Sydney to read and publish the text. Its contents record discussions about religion, human nature and the natural world held by sages from East and West at the court of the Persian king; and illuminate the dynamic cultural interchange between India and the Mediterranean world that characterised late antiquity.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985720 Prof SW Gaukroger
Approved Project Title **Science and the Shaping of Modernity, 1690-1755**

2009 : \$ 141,000
2010 : \$ 100,000
2011 : \$ 107,000
2012 : \$ 79,000
2013 : \$ 191,000

Primary RFCD 4401 PHILOSOPHY
APF Prof SW Gaukroger

Administering Organisation The University of Sydney

Project Summary

It is important that we understand the values underlying our culture, and one form of such understanding is historical. The idea that science provides the standards for all forms of cognitive enquiry is an intrinsic part of modern culture, and the notions of impartiality and objectivity that it is taken to express are closely tied in with estimations of the value of our culture. The history of how this conception emerged in the early-modern period shows that there was nothing self-evident in the assimilation of cognitive values to scientific ones, however, or in the extrapolation of these to general cultural and political values.

DP0985505 Dr R Gerlach; Prof MS Smith

Approved Project Title **Bayesian Inference for Flexible Parametric Multivariate Econometric Modelling**

2009 : \$ 50,000
2010 : \$ 48,000
2011 : \$ 50,000

Primary RFCD 3404 ECONOMETRICS

Administering Organisation The University of Sydney

Project Summary

The anticipated outcomes include the development of enhanced multivariate econometric models and innovative computationally intensive methods for their estimation. These models are used in numerous and diverse applications which are data-intensive and where more complete models will greatly enhance data-based decision-making. Results include improved information use in the wholesale electricity markets, in financial market investment decision-making and for the assessment of the impact of internet advertising.

DP0988307 Prof P Goodyear; Dr L Markauskaite

Approved Project Title **Professional learning for knowledgeable action and innovation: The development of epistemic fluency in higher education**

2009 : \$ 70,000
2010 : \$ 80,000
2011 : \$ 70,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Sydney

Project Summary

The ability to work effectively with complex knowledge, as a member of a multidisciplinary team, is essential for many areas of professional practice and in other areas of graduate work. Little is known about the abilities that allow individuals, teams and professional communities to work effectively with complex knowledge. The project will therefore help understand some key aspects of innovation and of knowledge-intensive work. This has implications for individual employability, the competitiveness of Australian firms in a global economy and the ability of Australian organizations to innovate and improve, using the best available evidence. Project outcomes will be able to inform the enhancement of professional education.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0988334 Prof P Goodyear; A/Prof RA Ellis; Prof MT Prosser

Approved Project Title **Learning through inquiry in Higher Education**

2009 : \$ 170,000

2010 : \$ 130,000

2011 : \$ 125,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Sydney

Project Summary

This project can make a significant contribution to socioeconomic well-being. It addresses a major dilemma in higher education practice. It focuses on learning through inquiry - an approach to education that many claim is particularly appropriate for training graduates for knowledge work in the 21st Century. Our project makes a timely intervention by providing broad-based evidence that can inform debates about the future direction of this area of higher education. In practical terms, take-up of the outcomes of this project can improve the quality of Australian higher education, as well as the knowledge and skills of graduates entering the Australian workforce. It helps understand what is involved in promoting an innovation culture.

DP0987706 Dr ME Graham; Prof PJ Robinson

Approved Project Title **O-GlcNAc-phosphorylation: a novel post-translational modification regulating vesicle recycling.**

2009 : \$ 100,000

2010 : \$ 100,000

2011 : \$ 100,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Sydney

Project Summary

We will determine a biological role for our discovery of a hybrid protein modification (both carbohydrate and phosphate) on a brain protein that is involved in nerve cell communication. If this modification is more widespread, then we will have discovered a new level of cellular regulation. This discovery is likely to have a broad benefit. It will advance the understanding of carbohydrate and phosphate modified proteins. For example, there may be consequences for the model of hyperphosphorylated and carbohydrate modified proteins involved in neurodegeneration. There will also be a targeted benefit. An improved understanding of the mechanism of neurotransmission will benefit in designing compounds to fight diseases of neurotransmission.

DP0986025 Ms TJ Hamilton

Approved Project Title **A neuromorphic binaural hearing sensor**

2009 : \$ 95,000

2010 : \$ 70,000

2011 : \$ 70,000

2012 : \$ 70,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

APD Ms TJ Hamilton

Administering Organisation The University of Sydney

Project Summary

A neuromorphic binaural hearing sensor will be created. The system includes two cochleae and targeted processing pathways in the auditory brainstem that aid in solving the Cocktail Party Problem: i.e. foreground-background sound separation, sound localisation, and sound recognition. The VLSI circuits will enable real-time implementation of complex auditory models. As we develop our VLSI binaural ear, we will experiment with afferent (feed forward) and efferent (feed back) auditory signal processing that is similar to real auditory systems and that demonstrate efficient, effective, and low-power signal processing algorithms for binaural (two-sensor) hearing systems.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984430 A/Prof EC Hardeman; Dr SJ Palmer

Approved Project Title **Mouse models for the identification of factors involved in muscle adaptation**

2009 : \$ 115,000

2010 : \$ 50,000

2011 : \$ 70,000

Primary RFCID 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

The ability of muscle to adapt to meet functional demands is essential for mobility in normal daily life, in ageing well, in individuals with muscle diseases and nerve damage and in athletes. The ability of muscle to change its cellular composition is desirable for the livestock industry. Knowledge of how genes in muscle cells are regulated to adapt to demands has significant implications for public health and economic benefits. We have devised model systems that will allow us to identify the regulators of these genes in order to develop therapies to combat these changes in ageing and damaged muscle, to improve the quality of meat and optimise sport performance.

DP0986137 A/Prof JA Harris; A/Prof CW Clifford; Dr E Arabzadeh

Approved Project Title **Peripheral and central mechanisms of sensory coding and integration**

2009 : \$ 100,000

2010 : \$ 115,000

2011 : \$ 115,000

2012 : \$ 115,000

Primary RFCID 3801 PSYCHOLOGY

Administering Organisation The University of Sydney

Project Summary

The research described in this proposal seeks to provide generic answers to fundamental questions about sensory processes, the nature of perceptual experience, and how these are subserved by the nervous system. The study of inter-sensory interactions in perception has the potential to be incorporated into the development of virtual reality-type computer-based technologies. The neurophysiology research will provide basic information that has the potential to deepen our understanding, and even enhance possible treatment, of neurological conditions that involve sensory systems.

DP0987811 Prof P Harrowell; Dr TS Hudson

Approved Project Title **Atomistic Mechanisms of Stress Relaxation in Amorphous Materials**

2009 : \$ 65,000

2010 : \$ 50,000

2011 : \$ 60,000

Primary RFCID 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

Amorphous materials represent a major thrust in the search for new materials. Metallic glasses have very high strength and can be cast to much finer tolerances than regular (polycrystalline) metals. Ceramic glasses are finding increasing applications in data storage, photoelectronics and fibre optics. The greatest obstacle to the application of amorphous solids is their brittleness. The goal of this project is to use accurate computer simulations to provide detailed pictures of how atomic motions relax stress in very different types of glasses and, through this insight, explore ways of modifying the mechanical properties of these materials.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985453 Prof BS Haynes
Approved Project Title **Scaleable Microstructured Chemical Process Systems**
2009 : \$ 125,000
2010 : \$ 125,000
2011 : \$ 125,000
Primary RFCD 2906 CHEMICAL ENGINEERING
Administering Organisation The University of Sydney

Project Summary

This project seeks to revolutionize the way bulk chemicals are made industrially. By combining highly integrated process designs, with profound process intensification, we will create the basis for chemical process technology that is efficient and economical at relatively small scale. This development will reinvigorate the Australian chemical industry, with enormous benefits to the country in terms of improved security of supply of chemicals and fuels and reduced trade deficit. This new type of plant will be scaleable and without the technical risk normally associated with plant scale-up. At the smallest scale, it will be mobile and able to utilise remote and dispersed feedstocks such as stranded natural gas, coal bed methane, or biogas.

DP0985184 Dr A Henderson
Approved Project Title **The geometry of exotic nilpotent cones**
2009 : \$ 20,000
2010 : \$ 20,000
Primary RFCD 2301 MATHEMATICS
Administering Organisation The University of Sydney

Project Summary

This research will describe the geometry of some important objects which sit at the boundary of algebra, geometry, and combinatorics. It has intrinsic value as a significant addition to the heritage of mathematical thought, and will strengthen Australian traditions in these areas of mathematics.

DP0986500 Dr BR Henderson
Approved Project Title **Dynamics and assembly of BRCA1-associated DNA repair complexes**
2009 : \$ 100,000
2010 : \$ 80,000
2011 : \$ 80,000
Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY
Administering Organisation The University of Sydney

Project Summary

This research project will study how cells respond to breakages in DNA by directing a team of repair proteins to the damaged DNA. BRCA1 is one of several repair proteins, and BRCA1 gene mutations impair its DNA repair function and predispose patients to breast/ovarian cancer. Improved insight into BRCA1 regulation could enhance our understanding of this disease. There are >13,000 new cases of breast/ovarian cancer each year with more than 3,300 deaths, making it a serious healthcare issue in Australia, and placing this project within Research Priority 2: Promoting and Maintaining Good Health. If successful this project will yield insights into the role of BRCA1 in fixing DNA aberrations which could help in anti-cancer agent development.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987878 Dr MJ Hendrickson; Dr C Pottier; Prof Dr HJ Leisen; Dr DE Cook; Dr Q Hua

Approved Project Title **Industries of Angkor: Material Production and the Decline of the Khmer Empire (11th to 15th centuries CE)**

2009 : \$ 128,000
2010 : \$ 108,000
2011 : \$ 93,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APD Dr MJ Hendrickson

Administering Organisation The University of Sydney

Project Summary

Australia is an important partner in developing and maintaining regional relationships in the Asia-Pacific region. Within Cambodia, Australia has made substantial contributions to the redevelopment of its social, academic and professional infrastructures shattered by decades of civil conflict. This multidisciplinary project will introduce new techniques for unlocking the relationship between settlement and industrial activity at Preah Khan, the largest Angkorian centre. Through collaboration with ongoing University of Sydney research, Cambodian universities and government institutions this project will further enhance Australian relations by contributing new information on the operation and demise of one of the World's great empires.

DP0987331 Dr AM Hopkins; Prof J Bland-Hawthorn

Approved Project Title **The mass assembly of galaxies and structure in the universe**

2009 : \$ 130,000
2010 : \$ 80,000
2011 : \$ 80,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Organisation The University of Sydney

Project Summary

Unlike most galaxies that can be seen to great distances, the majority of galaxies in the universe have masses much less than that of our own Milky Way, and live in comparatively sparse environments. For the first time we will investigate the relationship between dark matter and galaxies on all scales, by measuring over 120000 galaxies down to masses as little as 1/10000 that of our Milky Way, in environments from clusters of thousands of galaxies down to small groups of two or three. World-leading instrumentation at the Anglo-Australian Telescope makes this possible, and significantly magnifies the scientific value of supporting observations at international facilities, that comprise a time awarded facility value of over A\$10 million.

DP0985187 Dr K Howard; A/Prof S Jan; Dr A Cass; Dr J Rose; A/Prof SJ Chadban; Prof RD Allen

Approved Project Title **Community preferences for organ donation and allocation in Australia**

2009 : \$ 100,000
2010 : \$ 70,000
2011 : \$ 70,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The University of Sydney

Project Summary

This work will provide vital information on the Australian public's attitudes and preferences towards organ donation and allocation strategies, and inform the development of a national organ donation strategy that considers the public's preferences for different policies to increase organ donor rates. This project will directly address the National Research Priority of 'promoting and maintaining good health'; increasing the availability of donor organs, and improving the equity and transparency of organ allocation in Australia will lead to improved health outcomes for patients on transplant waiting lists around Australia, and improved health outcomes for patients not previously eligible for transplant (e.g. some dialysis patients)

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987960 A/Prof P Howie

Approved Project Title **Repeated questions in children's event recall: Testing competing explanations**

2009 : \$ 76,000

2010 : \$ 56,000

2011 : \$ 66,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Sydney

Project Summary

One of the threats to a healthy start in life for Australian children, and one which imposes substantial financial and emotional cost on the Australian community, is child abuse and neglect. This project addresses a key stumbling block in obtaining evidence from child victims/witnesses - their tendency to give inconsistent testimony under repeated questioning. It seeks to understand the conditions under which inconsistency is minimized, as a basis for developing empirically and theoretically based ways to optimise the accuracy and legal utility of children's testimony.

DP0987074 Prof NH Hunt; Dr HJ Ball

Approved Project Title **Indoleamine 2,3-dioxygenase-2: a newly discovered enzyme with a key role in kidney function.**

2009 : \$ 110,000

2010 : \$ 90,000

2011 : \$ 90,000

Primary RFCD 3203 MEDICAL BIOCHEMISTRY AND CLINICAL CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

We have discovered an enzyme, IDO2, that metabolises the amino acid tryptophan. The enzyme is found in kidney tubule cells and we propose that IDO2 activity regulates sodium reabsorption by the renal tubular cells. Regulation of sodium balance is important for determining blood pressure in health and disease.

DP0986960 Dr SD Jackson

Approved Project Title **Microfibre photonics: function densification on a wavelength scale**

2009 : \$ 160,000

2010 : \$ 85,000

2011 : \$ 85,000

2012 : \$ 120,000

2013 : \$ 130,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

QEII Dr SD Jackson

Administering Organisation The University of Sydney

Project Summary

The project will contribute to Australia's nanoscale device research and nanomanufacturing development. The project will create microfibre fabrication technologies for the creation of new optical systems of miniature proportions that will be used for cell illumination, for the creation of sensors for detection in small environments and as light tools for fundamental experiments in physics. Specialist fabrication methods will be developed that will add to the nation's skill base. The outcomes of the project will enhance Australia's knowledge capacity, research capability and will contribute significantly to each of the National Research Priorities.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985615 Prof N Joshi
Approved Project Title **Integrable Lattice Equations**
2009 : \$ 108,000
2010 : \$ 80,000
2011 : \$ 90,000
Primary RFCD 2301 MATHEMATICS
Administering Organisation The University of Sydney

Project Summary

When mathematical models are simulated on a computer, the result is a system of partial difference equations, whose solutions evolve with discrete steps on a lattice in space and time. While many tools have been developed to study continuous equations, very few mathematical techniques are available for analysing non-linear lattice equations. We aim to develop techniques of solving the initial-value problem for a class of such equations. Our examples include integrable lattice equations that arise in the simulation of many physical problems ranging from the progression of shallow water waves to signals in an optical fibre.

DP0987332 Dr AH Kemp; Dr KL Felmingham
Approved Project Title **Neurobiological bases for depression and anxiety: Towards an integrative model of emotion disorders**
2009 : \$ 100,000
2010 : \$ 50,000
2011 : \$ 75,000
Primary RFCD 3801 PSYCHOLOGY
Administering Organisation The University of Sydney

Project Summary

This study has five areas of national benefit. National research priority: This study will provide a basis for better understanding the underlying neural processes which distinguish these disorders and for developing more targeted treatments. Advancing the field: It will have significant implications for current theoretical models of emotion by integrating existing models and extending them. Intellectual leadership: It will promote Australian research in international affective neuroscience. Collaboration: It will draw upon a multidisciplinary approach consistent with the National Research priorities to foster collaborations. Training: It will provide students the opportunity to learn both specific knowledge and important generic skills.

DP0985611 Prof CJ Kepert
Approved Project Title **Advanced Functional Properties in Coordination Framework Materials**
2009 : \$ 220,000
2010 : \$ 190,000
2011 : \$ 190,000
Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)
Administering Organisation The University of Sydney

Project Summary

The design and construction of advanced nanomaterials represents both a key area of fundamental research and a critical step in the push towards smarter and more efficient high-level technologies. Here we explore the strategic synthesis of molecular materials that have entirely new and highly useful properties, namely, nanoporosity and negative thermal expansion. This innovative work will lead to important fundamental advances in nanoscience and will forge deep understandings of how physical properties relate to nanoscale structure. These advances will spur a wide range of important new technologies, with future application of the materials in molecular separations, sensing, energy conversion, electronics and photonics.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984692 Dr C Koepl

Approved Project Title **Evolution of sound localisation in vertebrates: head size, sound frequency and neural phase-locking**

2009 : \$ 121,000
2010 : \$ 111,000
2011 : \$ 111,000

Primary RFCD 2706 PHYSIOLOGY

Administering Organisation The University of Sydney

Project Summary

Hearing is our most important sense for interpersonal communication, yet we have a fragmentary understanding of the basic mechanisms involved in normal hearing. This project addresses the question of how sound location is represented in the brain through the processing of minute time difference with which sounds reach the two ears. The outcome will ultimately enable us to infer how the human brain localises sound, with practical applications for improved virtual auditory realities and hearing aids.

DP0986316 Prof PW Kuchel; A/Prof JI Vandenberg

Approved Project Title **Electro-active and migratory peptides in lipid bilayers: NMR and biophysical studies**

2009 : \$ 180,000
2010 : \$ 150,000
2011 : \$ 150,000

Primary RFCD 2499 OTHER PHYSICAL SCIENCES

Administering Organisation The University of Sydney

Project Summary

All living things are characterized by the separation of inner space from the surrounding medium by a self-assembling membrane. Selective entry and exit of water, ions and solutes is a defining feature of each type of cell. Some proteins sense the voltage difference across the cell membrane and open or close in response to voltage changes. Others, like bacterial toxins assemble in the membrane as pores, while other peptides migrate across the membrane piggy-backing their peptide cargo. The aim is to understand the molecular mechanisms in examples of these membrane-active peptides and proteins with a view to enabling rational intervention into their operation in situ in normal and disease states.

DP0988452 Dr EM Lamb

Approved Project Title **Reading Children in Early Modern Culture**

2009 : \$ 60,978
2010 : \$ 67,000
2011 : \$ 68,420
2012 : \$ 60,991

Primary RFCD 4202 LITERATURE STUDIES

APD Dr EM Lamb

Administering Organisation The University of Sydney

Project Summary

This project will offer new understandings of childhood as a historically- and culturally-contingent construct that will impact on perceptions of childhood in twenty-first-century Australia. It will use local and international archives to uncover a variety of early modern texts that were produced for children but have not yet been considered in terms of child readership. It is important to explore the significant historical links between children and literature as it will enable us to access the history of this marginalized group and will result in a more nuanced understanding of the cultural processes of educating children and the important role of literature in defining childhood identities, issues that continue to be relevant today.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987782 Dr BG Landfeldt; Dr L Libman

Approved Project Title **Coping with Chaos: Towards Efficient and Robust Wireless Networks through Opportunistic Cooperation**

2009 : \$ 75,000

2010 : \$ 70,000

2011 : \$ 65,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Organisation The University of Sydney

Project Summary

There is a tremendous uptake of short-range wireless technologies in consumer products. However, the ever-increasing network densities and uncoordinated deployment of devices compound the chaotic nature of wireless systems. Current technologies do not operate efficiently in high-density networks, degrading the user experience considerably. This research project will produce groundbreaking methods in network design and operation, where devices actively coordinate their actions for the benefit of all users. There is a huge opportunity for the Australian industry to become a world leader in this fast-growing space, and our work will facilitate new commercial enterprises as well as showcase Australian research in the area.

DP0985023 A/Prof TA Langrish

Approved Project Title **Improving Powder Properties by Using Spray Dryers to Process Amorphous Components of Solids into Crystalline Materials**

2009 : \$ 125,000

2010 : \$ 100,000

2011 : \$ 100,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Organisation The University of Sydney

Project Summary

Australia has a large food and dairy processing industry, capturing 13% of the world dairy export market, worth US\$460 million annually. This proposal will build on Australia's strengths in dairy and food industries, particularly milk powder products. This project will enhance our competitive advantage in the production of dried foodstuffs by streamlining their production and allowing tailored and new powder products to be created.

DP0985817 Prof RD Lansbury; Dr MP Baird; Dr RW Hall; Dr NR Wailes

Approved Project Title **Beyond our Control? The Impact of Multinational Corporations on Industrial Relations in Australia**

2009 : \$ 140,000

2010 : \$ 20,000

2011 : \$ 80,000

Primary RFCD 3502 BUSINESS AND MANAGEMENT

Administering Organisation The University of Sydney

Project Summary

There are two key national benefits associated with this project, related to building and transforming Australian industries and promoting an innovative culture and economy. It will build a better understanding of an issue which has significant consequences for the competitiveness of Australian enterprises and the well-being of employees. By focusing on the role of MNCs in shaping future employment relations in Australia, the project will provide insights into the economic and social consequences of globalisation. By examining MNCs from the US, Germany and Japan, the project highlights the role of Australia's key trading partners and their influence on Australian industry and employment relations.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984722 Prof PA Lay; Dr HH Harris; Dr MJ Tobin; Dr DJ Paterson; Dr MD de Jonge; Dr CJ Glover; Dr S Vogt; Dr GJ Foran

Approved Project Title **Microprobe and Nanoprobe Studies on Intracellular Disease Processes and Their Treatment**

2009 : \$ 250,000
2010 : \$ 220,000
2011 : \$ 220,000
2012 : \$ 150,000
2013 : \$ 155,000

Primary RFCD 2502 INORGANIC CHEMISTRY

APF Prof PA Lay

Administering Organisation The University of Sydney

Project Summary

Breakthrough microprobe and nanoprobe technologies, involving X-ray, visible and infrared light can focus into different components of mammalian cells in order to interrogate the biochemistry that is occurring therein. Each of the different wavelengths of light provides complementary biochemical information that enables a deeper understanding of changes in cells that occur as a function of drug treatments and disease processes. This will provide unprecedented information as to where drugs go and how they are transformed inside cells that, in turn, may revolutionise the way in which new drugs are designed that have higher specificity and fewer side effects.

DP0985522 Prof M Lenzen

Approved Project Title **Developing a global environmental, social and economic information system**

2009 : \$ 125,000
2010 : \$ 95,000
2011 : \$ 95,000

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

Administering Organisation The University of Sydney

Project Summary

The outcome of this project will be a unique environmental information system that will open up new global analytical perspectives for international institutions, corporations and academia. It will enable decision makers to identify hidden impacts of global supply chains that could so far not be enumerated. This research will enhance Australia's international reputation in spearheading advances in Environmental Accounting. It will fulfill ubiquitous needs of analysts worldwide, and become a sought-after export. It will demonstrate how Australians affect the global environment, and how we can improve it by changing the way we live and consume. This research is truly inter-disciplinary, and will benefit a multitude of other research areas.

DP0985140 Dr Y Li

Approved Project Title **Efficient Distributed Coding In Wireless Networks**

2009 : \$ 80,000
2010 : \$ 60,000
2011 : \$ 60,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Organisation The University of Sydney

Project Summary

Multi-hop relay networking has been considered to be a significant evolution of future wireless networks. This project will expand the knowledge of multi-hop relay networking by creating a new set of distributed coding and cooperative signal processing techniques. The proposed research is significant for improving the capacity and coverage of wireless networks. Australia's unique geography, with vast sparsely populated areas, is ideally suited for the deployment of this technology to provide high data rate service over large geographical areas.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985450 Dr X Liao; Mr Y Wang; Dr C Lu; A/Prof Y Shen

Approved Project Title **Atomistic mechanisms of the mechanical behaviour of nanostructured silicon carbide films**

2009 : \$ 100,000

2010 : \$ 100,000

2011 : \$ 100,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Organisation The University of Sydney

Project Summary

Advanced silicon carbide (SiC) ceramics are leading candidates for applications in high-power, high-speed machining and high-temperature structural components. Superhardness and high ductility (or high fracture toughness), which have been realized in some nanostructured (ns) SiC films and nanowires, respectively, are desirable properties for many applications. This project aims to understand the mechanisms behind the exceptional properties in ns SiC and to explore the possibility of realizing the two properties in the same ns SiC. The results obtained from this research will be very important for guiding the structural design of SiC with exceptional mechanical properties which will have a wide range of structural applications.

DP0987294 Prof LF Lindoy; Prof GV Meehan

Approved Project Title **Metal Directed Assembly of New Discrete and Framework Supramolecular Systems**

2009 : \$ 80,000

2010 : \$ 70,000

2011 : \$ 70,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

An important aspect of this project is the development of strategies for assembling molecules and metals into larger units - leading to novel compounds and materials for which unusual and potentially useful properties can be anticipated. These may include materials that act as catalysts for chemical reactions or absorb and store gases (such as hydrogen for use as a fuel). More generally, the area is one that will underpin the 'bottom-up' approach (building tiny components from individual molecules and ions) in the rapidly expanding field of nanotechnology. Clearly, if Australia is to remain internationally competitive in such new technologies then an understanding of processes of the type outlined in this proposal will be essential.

DP0984936 Prof GM Llewellyn; Prof E Emerson; Dr A Honey

Approved Project Title **Improving the life chances of young disabled Australians**

2009 : \$ 65,000

2010 : \$ 60,000

2011 : \$ 60,000

Primary RFCD 3701 SOCIOLOGY

Administering Organisation The University of Sydney

Project Summary

This project will determine the social and economic impact of disability on young people and identify why some young people experience more negative outcomes. The outcome will be a model of the impact of disability which can be used to guide and monitor progress towards Australia's social inclusion agenda for people with disabilities. A substantial benefit will be growth in Australia's capacity in disability disadvantage research.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985867 Dr D Lu; Prof VG Agelidis

Approved Project Title **Hot-swappable and High-efficient Grid-connected Power Electronics System For Photovoltaic Modules with Direct Power Transfer Technique**

2009 : \$ 65,000

2010 : \$ 55,000

2011 : \$ 55,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

Administering Organisation The University of Sydney

Project Summary

The project aims to increase the amount of available energy intake from photovoltaic panels, lengthen lifetime of power DC/AC inverter, reduce the amount of energy waste due to inefficient inverter by introducing new switching power converters with direct power transfer technique - bypassing part of the input power without repeatedly processing it, and using long-life ceramic type capacitors. Development of this technology will mean reduced total cost, improved product lifetime and reduced global warming. It will lead to a reliable product that will help to put the Australian switching power converter industry into a leading position internationally in the design and manufacture of DC/AC inverters.

DP0985312 Dr Y Lu

Approved Project Title **Fundamentals of Damage Identification in Tubular Structures Using Guided Waves**

2009 : \$ 100,000

2010 : \$ 100,000

2011 : \$ 100,000

Primary RFCD 2908 CIVIL ENGINEERING

APD Dr Y Lu

Administering Organisation The University of Sydney

Project Summary

This project addresses fundamental but frontier issues and techniques that will lead to ultimate solutions for online integrity/safety assessment of tubular engineering structures. The most important outcome will be the development of fundamental knowledge and algorithms of guided wave-based damage identification in tubular structures in applications, putting Australia at the international forefront of techniques in efficient asset maintenance and management. This project focuses on cutting-edge technologies, including sensor networks with signal filtering/processing and software/hardware integration, which will incubate the commercialisation of practical sensor networks, benefiting the intellectual leadership of Australia.

DP0984682 Dr JP Mackay; Prof M Crossley

Approved Project Title **A new mechanism of gene regulation**

2009 : \$ 230,000

2010 : \$ 220,000

2011 : \$ 220,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

This project will advance our knowledge of how genes are switched on and off, by focusing on a very common class of gene regulatory proteins known as zinc finger proteins. The results of this study will improve our understanding of the fundamental molecular events that underpin gene regulation and how we might control it in fields such as biotechnology and gene therapy.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984726 Dr JP Mackay

Approved Project Title **New mechanisms of DNA recognition by zinc-finger domains**

2009 : \$ 140,000

2010 : \$ 140,000

2011 : \$ 140,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

The work described in this proposal carries long-term benefits to the health of Australians. Many debilitating diseases, including many varieties of cancer, arise as a result of a breakdown in the normal regulation of gene transcription. It is only once we have a thorough understanding of transcriptional regulation in normal organisms that we will be in a position to devise effective therapies to deal with the disorders that result from aberrant gene expression. Our proposed research program also provides the opportunity to train younger scientists in state-of-the-art molecular and structural biology, thus representing a significant national benefit.

DP0986689 A/Prof AJ Martin

Approved Project Title **The Millennium Child: New Frontiers in Understanding the Adaptability of Children and Young People**

2009 : \$ 120,000

2010 : \$ 120,000

2011 : \$ 100,000

2012 : \$ 57,108

2013 : \$ 50,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Sydney

Project Summary

Australian children and young people experience changes and challenges at micro (eg. educational, psychological, social) and macro (eg. climate change, globalisation) levels. Successfully resolving these relies to a large degree on their ability to adapt. At a broader level, for Australia to compete and innovate on a global scale and to most profitably fulfil its educational, social, economic, and cultural potential, it is essential that it nurtures children and young people who can adapt to and for the challenges and opportunities of the 21st Century. The Millennium Child Project scopes and progresses the concept of adaptability and answers important and complex questions relevant to a nation's capacity to adapt and thrive.

DP0987166 Prof Dr T Maschmeyer

Approved Project Title **Renewable fuels and chemicals from fibrous organic waste and non-food crops**

2009 : \$ 150,000

2010 : \$ 140,000

2011 : \$ 140,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Organisation The University of Sydney

Project Summary

At current rates of resource usage, a world population with Australian standards of living would require between four and six planets. Solutions to existing and impending resource scarcity (water, power, chemical feedstocks) and associated greenhouse pollution are required in the short- to medium-term. The new catalysts and processes and their novel integration into an effective refining stream are designed to deliver the required breakthroughs, which will enable the broad adoption of lignocellulosic biomass for a sustainable solution. This is a major opportunity for Australia to address the fossil-fuel conundrum, and to show scientific leadership in an area that is set to drive economic and political change in the 21st century.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0986349 A/Prof A Mathas; Dr A Henderson

Approved Project Title **Pyramids and decomposition numbers for the symmetric and general linear groups**

2009 : \$ 98,000
2010 : \$ 85,000
2011 : \$ 78,000
2012 : \$ 80,000
2013 : \$ 87,000

Primary RFCD 2301 MATHEMATICS

APF A/Prof A Mathas

Administering Organisation The University of Sydney

Project Summary

This project takes a novel approach to the decomposition number problem for the symmetric and general linear groups by setting up a new framework for computing them using the combinatorics of pyramids. The decomposition numbers of an algebra are an important statistic which gives detailed structural information about its representations. These numbers can be used to compute the dimensions of the irreducible representations of the algebra and they play an important role in the applications of representation theory to other fields such as knot theory and statistical mechanics.

DP0985020 Dr JM Matthews

Approved Project Title **Cracking the LIM-code: Transcription factor networks in developmental biology**

2009 : \$ 145,000
2010 : \$ 145,000
2011 : \$ 145,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Sydney

Project Summary

Our current inability to stimulate the regeneration of nervous tissue is frustrated by a lack of detailed knowledge of the complex processes that take place at the molecular and cellular levels during development. We are determining how a group of cellular proteins that have key roles in neural development interact with each other and with DNA. With this information we are developing reagents that can be used to probe the fundamental process of cell differentiation in the central nervous system.

DP0987943 Dr MA McDonnell

Approved Project Title **Charles Langlade, the Anishinaabeg, and the making and unmaking of the Atlantic World**

2009 : \$ 60,000
2010 : \$ 20,000
2011 : \$ 21,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Sydney

Project Summary

As Australia and its allies face one of their greatest challenges - the peaceful incorporation of refugee groups into its borders, and non-state communities into newly redrawn national boundaries - the lessons of the past are timely. Using an historic case study, this project will examine the relations between such communities and the larger political entities that sought to incorporate them. In doing so, the project will explore the connections between the small politics of local village worlds with the larger politics of globalisation in the past - thus enhancing Australia's ability to engage with the wider global community today.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0988609 Dr IS McGregor
Approved Project Title **Models of adolescent drug use and its consequences**

2009 : \$ 144,000
2010 : \$ 131,000
2011 : \$ 149,000
2012 : \$ 150,000
2013 : \$ 120,000

Primary RFCD 3801 PSYCHOLOGY

APF Dr IS McGregor

Administering Organisation The University of Sydney

Project Summary

Recent concerns surround the impact of drug abuse - particularly binge drinking, inhalant abuse and cannabis use - on the mental health of adolescents. Early drug use is associated with mental health problems although the mechanisms involved are not well characterised. The present proposal aims to use animal models to characterise substance abuse that occurs during the adolescent period and to investigate its effects on brain and behaviour. Increasing our knowledge of the causes and consequences of adolescent drug abuse will improve Australia's ability to confront this problem and to develop early interventions and treatments that minimise associated harms.

DP0988166 A/Prof SR Meikle; A/Prof RR Fulton; Prof RB Banati

Approved Project Title **Simultaneous measurement of brain function and behaviour in fully conscious laboratory animals**

2009 : \$ 130,000
2010 : \$ 100,000
2011 : \$ 100,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Organisation The University of Sydney

Project Summary

MicroPET is an advanced imaging technology that measures important biochemical processes, such as enzyme activity rates and receptor binding, in the living rodent brain. However, the requirement for the animal to be anaesthetised precludes the study of behavioural changes in response to sensory or drug stimulus during the imaging study. In this research, we will develop novel motion tracking and computational algorithms that enable microPET to non-invasively image the brains of conscious, freely moving animals while simultaneously observing their behaviour. These new technologies will, for the first time, allow neuroscientists to study the genetic, behavioural and neurochemical correlates of brain disease.

DP0988731 Dr A Merchant

Approved Project Title **Metabolite pools and their implications for plant responses to global change**

2009 : \$ 120,000
2010 : \$ 78,591
2011 : \$ 78,591

Primary RFCD 2704 BOTANY

APD Dr A Merchant

Administering Organisation The University of Sydney

Project Summary

Australian landscape management faces significant challenges from existing land practices and the effects of climate change. Effective management and targeted remediation requires an understanding of the processes that drive ecosystem function. The development of broadly applicable tools for the monitoring of plant and ecosystem health is therefore of considerable interest. Flexibility in core processes of plant function represents a significant opportunity to develop such tools. With a focus on plant metabolites, this project will characterise how Australian trees alter the allocation of resources to cope with environmental changes and produce metabolite-based selective traits for stress tolerance in Australian trees.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987707 A/Prof J Milam
Approved Project Title **The Business of Art: Corporate Interventions into the Production, Display, and Reception of the Visual Arts**
2009 : \$ 50,000
2010 : \$ 52,000
2011 : \$ 92,000
Primary RFCD 4199 OTHER ARTS
Administering Organisation The University of Sydney

Project Summary

The corporate presence in the Australian art world has increased exponentially over the past decade, resulting in a redefinition of the arts as an industry not to be subsidised but marketed. This project's analysis of the art historical implications of this corporate presence and an assessment of the aesthetic impact of increased corporate interventions into the production and display of art is of vital significance to the future of Australia, not only in terms of the quality and type of art that is produced by Australian artists, but also to the way that Australians understand the role of the visual arts in their society.

DP0987186 Dr KL Miller
Approved Project Title **Fundamental Ways the World Could Be: Challenging Metaphysical Orthodoxy**
2009 : \$ 33,000
2010 : \$ 31,000
2011 : \$ 45,000
Primary RFCD 4401 PHILOSOPHY
Administering Organisation The University of Sydney

Project Summary

This project strengthens Australia's fine reputation in metaphysics through disseminating cutting-edge research. It will build relationships with leading researchers and bring their knowledge to Australia, fostering an intellectual environment that strengthens Australia as a destination for tertiary study and international researchers. It will offer explicit training in research skills and provide wide-ranging knowledge for a postgraduate student. In clarifying and answering key fundamental metaphysical questions that have wide ramifications, it will provide a sound basis and the conceptual resources for both ethicists, philosophers of science and scientists to theorise about us as agents in the world, and about the nature of our world.

DP0987580 Prof RA Minasian
Approved Project Title **New paradigms for high-resolution microwave photonic signal processing.**
2009 : \$ 220,000
2010 : \$ 140,000
2011 : \$ 165,000
2012 : \$ 215,000
2013 : \$ 220,000
Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES
Administering Organisation The University of Sydney

Project Summary

In today's society there is an unrelenting push for increasing bandwidth requirements. Thus there are unprecedented challenges 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 essential to address different interferers actively while having minimal impact on the required signal. The new dynamically reconfigurable 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.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987590 Dr AD Moses

Approved Project Title **Genocide: Critical History of an Idea**

2009 : \$ 70,000

2010 : \$ 28,000

2011 : \$ 33,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Sydney

Project Summary

Australians have been accused of genocide against Indigenous peoples. Australian troops are sent abroad to participate in humanitarian interventions based on the occurrence of genocide. Yet its meaning is bitterly contested. By explaining the origins of the genocide concept, how and why it has changed since its codification after World War II, as well as how it is used today, I will clarify knowledge of genocide's meanings in international law, politics and diplomacy. Australia's status and role in the international community is based in part on its stance against genocide. It is imperative, therefore, that its meanings are accurately understood.

DP0987515 Dr DJ Moss

Approved Project Title **Silicon All-Optical Nanophotonic Devices for 160Gb/s Systems**

2009 : \$ 150,000

2010 : \$ 100,000

2011 : \$ 120,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Organisation The University of Sydney

Project Summary

With the exponential growth in global bandwidth demand, the speed, cost, size, and energy requirements of telecommunications equipment are reaching a crisis point. This project will pioneer ultra-high speed silicon integrated all-optical signal processing devices that will provide faster, cheaper and more energy efficient solutions than current electronic based approaches. In doing so, this will also directly benefit the Australian photonics, telecommunications, and defence industries. It will use novel structures such as nanowire waveguides and micro-ring resonators to demonstrate all-optical signal regeneration, wavelength conversion, demultiplexing and other functions at speeds up to 160Gb/s.

DP0986377 A/Prof D Muller; Dr G Morra

Approved Project Title **Planet-scale reorganizations of the plate-mantle system**

2009 : \$ 110,000

2010 : \$ 95,000

2011 : \$ 95,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Sydney

Project Summary

Vast sedimentary basins, fold belts and associated resources represent the main source of Australia's wealth, formed largely as consequences of major global tectonic events. We propose to connect two key national Simulation and Modelling infrastructures to a novel geodynamic modelling tool, developed specifically for modelling plate tectonics at the global and regional scale and suitable to unravel the causes and consequences of sudden global plate tectonic reorganizations. The knowledge-base derived from this work will considerably improve our understanding of catastrophic tectonic events affecting plate boundaries and plate interiors.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987713 A/Prof D Muller; Dr M Sdrolias; Dr M Gurnis; Prof TH Torsvik

Approved Project Title **The Subduction Reference Framework: unravelling the causes of long-term sea-level change**

2009 : \$ 100,000

2010 : \$ 75,000

2011 : \$ 75,000

2012 : \$ 60,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

APD Dr M Sdrolias

Administering Organisation The University of Sydney

Project Summary

Long-term global sea level fluctuations have been a driving force of biogeography, climate change and organic evolution. We will assimilate images of subducted tectonic plates in the Earth's mantle into geodynamic models to establish a novel Subduction Reference Frame for the past 200 million years. This will form the basis for unravelling the effects of subduction on surface topography and sea-level change. The project outcomes will include predictive models of sedimentation and erosion in continental interiors, and will transform knowledge about the nature and magnitude of natural planetary change.

DP0986928 Dr HR Nicholas; Prof M Crossley

Approved Project Title **The transcriptional co-repressor C-terminal Binding Protein (CtBP) in metabolic control**

2009 : \$ 110,000

2010 : \$ 90,000

2011 : \$ 90,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

This project will provide insights into the genes that regulate the storage of fat. We will learn about basic biology but will also discover mechanisms that may be used to influence fat storage in human health. We will also consolidate Australia's expertise in the use of the genetic model organism, the worm *C. elegans*, and validate the findings in mammalian systems. Finally, the process of training young scientists in these modern systems, will also equip future researchers to make additional contributions to Australia's research output.

DP0985189 Prof BP Oldroyd

Approved Project Title **Choosing when to be sexual: clonal and sexual reproduction in a population of honey bees**

2009 : \$ 100,000

2010 : \$ 80,000

2011 : \$ 70,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The University of Sydney

Project Summary

Sex is costly. There is the cost of finding a mate and the genome of offspring must be shared with the mating partner. Despite these costs, sex is common in animals, so the benefits of sex must be substantial. Benefits may include the prevention of inbreeding and generating variable offspring. Exploring the trade off between sex and cloning requires a model system where individuals can choose to reproduce sexually or asexually. This project will explore a population of honey bees where a genetic mutation allows queens to clone themselves or reproduce sexually. We will reveal the unusual genetic mechanisms behind this ability and show how they are used by queens and workers to increase their reproductive success.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984968 Dr D O'Reilly; Dr RA Armstrong; Dr KM Domett; Dr LG Shewan; Prof CF Higham; Prof R Chhem; Dr N Beavan Athfield; Dr C Pottier

Approved Project Title **History in their bones: A diachronic, bioarchaeological study of diet, mobility and social organisation from Cambodian skeletal assemblages**

2009 : \$ 74,000
2010 : \$ 56,000
2011 : \$ 24,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

Administering Organisation The University of Sydney

Project Summary

Australia will further enhance its role as an innovator in the archaeology of SE Asia through this cross-disciplinary, international collaboration on the mobility, health, age and diet in ancient Cambodia. Local collaborations will be expanded and academic and cultural relations with Cambodia will be reinforced and strengthened. This research will expand understanding of Cambodian history and underscore its pivotal role in mainland SE Asian archaeology. Australia's advancement of knowledge about Cambodia's rich cultural antiquity will be recognized worldwide by a global community acutely mindful of the losses to culture and heritage endured by Cambodia in the recent past.

DP0988712 Prof PN Parkinson; A/Prof JA Cashmore; Hon Prof RC Chisholm

Approved Project Title **Relocation after parental separation: a longitudinal study**

2009 : \$ 140,000
2010 : \$ 100,000
2011 : \$ 120,000

Primary RFCD 3901 LAW

Administering Organisation The University of Sydney

Project Summary

This project is to examine the long-term outcomes of relocation disputes, when one parent after separation wants to move far away with the children against the opposition of the other parent. The study is of great international importance, as these disputes have become so numerous and difficult to resolve. The results of the study will enhance Australia's international reputation as a leader in family law innovation and research. The national benefits will include better information for courts in making relocation decisions and an evidence-base for the Government to make legislative changes if needed.

DP0986632 Dr RJ Payne

Approved Project Title **Chemical synthesis of cancer-associated glycoproteins**

2009 : \$ 161,000
2010 : \$ 158,000
2011 : \$ 166,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

Glycosylation of proteins is an extremely common event which plays an important role in a variety of biological processes. Aberrant glycosylation and over-production of glycoproteins is associated with numerous cancer types (including breast, prostate, ovarian and small lung) and are recognised as promising agents for disease diagnosis and vaccine development. A range of cancer-associated glycoproteins will be synthesised in this research program using a number of novel chemical technologies. These glycoproteins will be used to develop cancer vaccines and diagnostics. Cancer is a severe burden on the Australian community and on the economy, therefore this research will be of significant benefit to Australia.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984888 Dr L Pizzatto do Prado

Approved Project Title **Host-parasite interactions during a biological invasion: toads, frogs and nematodes in tropical Australia**

2009 : \$ 140,000
2010 : \$ 80,000
2011 : \$ 80,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APD Dr L Pizzatto do Prado

Administering Organisation The University of Sydney

Project Summary

Cane toads were introduced to Australia 70 years ago, and are widely believed to cause major problems for native ecosystems. My work has identified another impact of cane toads: they have brought some of their native-range parasites with them from Central America, and at least one species (a lungworm) now attacks native Australian frogs. This project will explore the impact of the parasite on native frogs as well as on the toads themselves, and determine why some (but not all) toad populations in Australia have escaped from these viability-reducing parasites. My work will clarify host-parasite coevolution, the ecological impact of invasive organisms, and the feasibility of using parasites to help control toads within Australia.

DP0984465 Prof DT Potts

Approved Project Title **From village to empire in the Zagros highlands: Archaeological investigations at Tol-e Nurabad (Fars Province, Iran)**

2009 : \$ 104,000
2010 : \$ 104,000
2011 : \$ 104,000
2012 : \$ 78,590
2013 : \$ 104,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APF Prof DT Potts

Administering Organisation The University of Sydney

Project Summary

This joint Australian-Iranian archaeological project will strengthen an important collaborative partnership between Australia and Iran in an area of mutual interest - the investigation of past societies. The human significance of such collaboration extends far beyond Australia's commercial relationship with Iran. It will build bridges and promote understanding between the two societies at both a scientific and grassroots level. It is a tangible expression of goodwill and a genuine interest in Iran's past, as well as an investment in a cultural and human relationship with one of the most important countries in the Middle East.

DP0987083 Prof EC Probyn

Approved Project Title **Taste and Place: the transglobal production and consumption of food and drink**

2009 : \$ 79,000
2010 : \$ 70,000
2011 : \$ 75,000

Primary RFCD 4203 CULTURAL STUDIES

Administering Organisation The University of Sydney

Project Summary

This project will explore the challenges and potentials that the transformations in production and consumption of food and drink pose to Australia. We have an enviable reputation for our wine and the quality of our food produce. But we have stiff competition from around the world. This is exacerbated by economic and cultural trends, which are changing the face of how and what we eat and drink. The homogenisation of mass-market consumption is producing a widespread dissatisfaction with our diet, and obesity. This cross-cultural project will result in important information about how we can best respond to these challenges.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985193 Prof CJ Pybus; Prof RL Isaac; Prof I Berlin; Prof OV Burton; Prof J Sidbury

Approved Project Title **Interrogating the Book of Negroes: explorations of slavery and freedom in the Atlantic world in the era of the American Revolution.**

2009 : \$ 130,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Sydney

Project Summary

Australia is a close political ally of the United States and an avid consumer of their culture, so it is important we be contributors to American culture and society, not simply passive recipients of its products. Since Rhys Isaac won the Pulitzer Prize in 1983, Australians have shown they can be at the cutting edge of American intellectual life, demonstrating an innovative engagement with the historical processes that formed this powerful nation. A project led by Australian scholars to examine the paradox of liberty in the nation's founding will further enhance the international profile of Australian scholars, thus attracting more overseas university students, who represent a significant source of export income.

DP0989030 Prof KJ Rasmussen; Prof GJ Hancock

Approved Project Title **Advanced analysis methods for locally unstable steel structures**

2009 : \$ 125,000

2010 : \$ 120,000

2011 : \$ 130,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation The University of Sydney

Project Summary

The project will provide structural design and consulting engineers with advanced analysis tools which will help the profession to maintain its eminent position as a leader in the field, known for creating innovative solutions to complex structural engineering projects. The availability of advanced analysis tools will promote research and innovation by Australian producers of cold-formed and thin-walled steel construction products, such as BlueScope Steel, and will encourage innovation in industry which will translate to enhanced export opportunities. The end consumer will benefit from the superior structural products which will eventuate from the innovation stimulated by the analysis methods devised from this project.

DP0986364 Prof PJ Read

Approved Project Title **A history of Aboriginal Sydney since 1788**

2009 : \$ 130,000

2010 : \$ 120,000

2011 : \$ 120,000

2012 : \$ 79,000

2013 : \$ 186,000

Primary RFCD 3799 OTHER STUDIES IN HUMAN SOCIETY

APF Prof PJ Read

Administering Organisation The University of Sydney

Project Summary

This project will illustrate the complex nature and history of Sydney's Indigenous population. Striking benefits will flow from tracing the historical relationships between the non-Indigenous and Indigenous peoples of the region, particularly in mutual understanding. Reconciliation cannot take place without a full understanding of how the first inhabitants and the newcomers have interacted for more than 200 years. Mutual comprehension will help to build healthy, productive and fulfilling Aboriginal lives. A comprehending and cohesive Australia will be all the stronger to tackle complex social issues within and outside our national borders.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984296 Prof PM Redding; Dr PD Bubbio

Approved Project Title **The God of Hegel's Post-Kantian Idealism**

2009 : \$ 151,000

2010 : \$ 108,000

2011 : \$ 151,000

2012 : \$ 32,972

Primary RFCD 4401 PHILOSOPHY

APD Dr PD Bubbio

Administering Organisation The University of Sydney

Project Summary

Recently both philosophical and popular debates over the role of religion in modern society have, like earlier debates from the 18th century, been marked by a commitment to philosophical realism. In the largely neglected "idealist" tradition of the nineteenth century, such disputes were cast in a different light. By developing an idealist conception of God, using contemporary philosophical resources, this project aims to offer a way of thinking about the role of religion in human life that avoids the primacy of the question of belief in God as well as antagonistic conceptions of religious differences.

DP0986873 Prof P Reimann; Dr RA Calvo; Dr K Yacef

Approved Project Title **Comprehensive support for collaborative writing: Visualising argument, text and process structures**

2009 : \$ 110,000

2010 : \$ 80,000

2011 : \$ 80,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Sydney

Project Summary

This project will provide benefits on a national level due to the importance of collaborative writing (CW) in business, government, and research. Most writing in professional contexts is, to some extent, accomplished collaboratively, but writing is taught almost exclusively individually. This research will yield a suite of integrated software tools to support all aspects of the CW team process, and the effectiveness of the main innovations will be empirically tested. This has the potential to contribute to the competitiveness of Australia's businesses and to the efficiency of its administrative systems. Further benefits include improved e-learning tools in the secondary and tertiary education sector, such as online team learning.

DP0986055 A/Prof LM Rendina; Prof BJ Allen; Prof A Matsumura

Approved Project Title **New Boron and Gadolinium Agents for Neutron Capture Therapy**

2009 : \$ 170,000

2010 : \$ 120,000

2011 : \$ 120,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

The development of new drugs and treatments for cancer is highly important for improved health outcomes and the well-being of the community. This research has the potential to result in the development of new anticancer pharmaceuticals that will dramatically expand the clinical efficacy of a promising treatment for highly aggressive tumours. The innovative nature of this research will also contribute to Australia's science knowledge base, a key element in its future economic prosperity, and it will provide excellent training of young researchers for employment in the rapidly expanding field of drug design and development.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0987604 Dr PF Rey; Dr A Dutkiewicz

Approved Project Title **The Origin of Australian Opal Deposits: Unlocking the Secrets of an Australian Icon**

2009 : \$ 80,000

2010 : \$ 75,000

2011 : \$ 70,000

Primary RFCD 2601 GEOLOGY

Administering Organisation The University of Sydney

Project Summary

Opal is the National Gemstone of Australia. With over 95% of world's precious opal being mined in Australia, this precious mineral is not only one of our major export earners but also the life blood of many central Australian townships. Despite its economic significance and long history of mining little is known about the formation of opal. Consequently, exploration is still based on old-fashioned prospecting methods rather than on genetic exploration models that have made base metal exploration so successful. The aim of this project is to investigate the processes controlling the formation of Australian opal and to use this information to construct an exploration model that will lead to more effective and efficient exploration methods.

DP0984930 Dr D Rickles

Approved Project Title **The Development of Quantum Gravity**

2009 : \$ 127,500

2010 : \$ 124,000

2011 : \$ 124,000

2012 : \$ 124,000

2013 : \$ 118,000

Primary RFCD 3706 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE

ARF Dr D Rickles

Administering Organisation The University of Sydney

Project Summary

This research constitutes the first large-scale effort to unpack and make sense of the development of quantum gravity. Given the pressing nature of this problem and its importance for our worldview, such a study would be of great benefit to several sectors of the academic community. By giving a global perspective of the field from its origins those outside the field will be able to appreciate its importance and its place in contemporary physics. Quantum gravity researchers will be able to see how their preferred approach fits into the web of research programmes, thus opening the door for greater collaboration between the various approaches. This research will greatly enhance Australia's position in this breakthrough science.

DP0984426 Prof SP Ringer; Prof MA Green; Dr B Gault

Approved Project Title **Structure-Activity Relationships in Silicon-based Photovoltaics Through Atomic Scale Microscopy**

2009 : \$ 320,000

2010 : \$ 160,000

2011 : \$ 170,000

2012 : \$ 166,000

Primary RFCD 2914 MATERIALS ENGINEERING

APD Dr B Gault

Administering Organisation The University of Sydney

Project Summary

This project aims to develop new design principles for silicon-based photovoltaics (PVs) through a comprehensive study of atomic-scale structures and phenomena in PV materials. The development of more efficient photovoltaic materials is of major global importance, given the pressing need for clean and renewable sources of energy. Australia has international leadership in developing solar cell technologies, and the ideal natural environment to exploit these technologies. The fundamental insights derived in this project, such as detailed 3D maps of dopant distributions at the atomic scale, will bolster Australia's international reputation in the field and provide better control in the design of PV devices.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0986230 Dr R Rohanizadeh; Prof RS Mason; Prof RZ LeGeros
Approved Project Title **Drug-delivery coating for a new generation of orthopaedic implants**
2009 : \$ 125,000
2010 : \$ 95,000
2011 : \$ 105,000
Primary RFCD 2915 BIOMEDICAL ENGINEERING
Administering Organisation The University of Sydney

Project Summary

In Australia, the number of people using artificial implants in orthopaedic and dental surgeries is rapidly increasing due to the higher average age of the population and higher expectations for an active and healthy life. The project will enhance the success rate of titanium implants by increasing the strength and stability of tissue at the interface between implant and host, particularly in case of hip joint implants, reducing the need for revision surgery.

DP0984807 Dr S Santra
Approved Project Title **Blow-up phenomena in semilinear elliptic partial differential equations**
2009 : \$ 69,000
2010 : \$ 67,000
2011 : \$ 67,000
2012 : \$ 67,000
Primary RFCD 2301 MATHEMATICS
APD Dr S Santra
Administering Organisation The University of Sydney

Project Summary

This project will address important questions in semilinear elliptic partial differential equations. It will determine the existence, multiplicity, breaking of symmetry, and concentration phenomena of solutions of semilinear partial differential equations. The asymptotic behaviour of solutions in semilinear equations has enormous potential to impact on fields in which differential equations can be applied to simple mechanical systems, and built and diverse natural phenomena such as suspension bridges, galaxies and mathematical biology problems.

DP0988103 Dr KL Savell; Dr IA Karpin
Approved Project Title **The Legal Function of Serious Disability in Prenatal and Neonatal Health Care Settings**
2009 : \$ 89,000
2010 : \$ 58,000
2011 : \$ 82,000
Primary RFCD 3901 LAW
Administering Organisation The University of Sydney

Project Summary

Increasing numbers of Australians are using prenatal testing technologies to avoid having a disabled child. Australians also have access to a range of sophisticated life-sustaining technologies for premature newborns and seriously imperiled infants. Legal guidance on the appropriate uses of these technologies is piecemeal and inconsistent across Australia's States and Territories, and the meaning of serious disability varies amongst members of the community. This project will benefit Australians by providing greater consistency in decision-making about disability. This will be achieved by assessing the value of a uniform framework for governing legal responses to serious disability in the context of reproduction.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985767 Dr T Schmidt; Prof SH Kable; Dr BK Nauta; Dr R Sharp

Approved Project Title **Molecules as probes of the interstellar medium**

2009 : \$ 100,000

2010 : \$ 80,000

2011 : \$ 80,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Organisation The University of Sydney

Project Summary

It is one of the greatest challenges in Nature is to remotely identify what is in space. Interstellar molecules are identified by their spectra, but many features in these spectra are unknown, implying that there are many more molecules in space than we know about. With a stronger understanding of space chemistry, we could predict what should be there and verify it in the lab. Conversely, identification of these features will provide the tools to understand interstellar chemistry. In this project we combine skills in spectroscopy and astronomy to make these molecules in the laboratory, measure their spectra and thereby identify unknown molecules in space.

DP0986328 A/Prof HT See; Dr A Jabbarzadeh

Approved Project Title **Multiscale modeling of flexible fibrous suspensions under flow**

2009 : \$ 120,000

2010 : \$ 95,000

2011 : \$ 95,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Organisation The University of Sydney

Project Summary

The outcome of this work will be a comprehensive theoretical framework by which microstructural information is distilled into an accurate multiscale model of fibre suspensions, readily applicable to industrial situations. This work will have a direct impact on the design capability and performance of a wide range of mechanisms and industrial processes involving fibres. The development of better models for industrially useful suspensions offers a competitive advantage for a diverse range of Australian industries, from the paper manufacture sector, to the production of fibre-filled composite materials.

DP0984771 Prof R Shine; Dr BL Phillips

Approved Project Title **The roles of stress and immunocompetence in biological invasions**

2009 : \$ 270,000

2010 : \$ 210,000

2011 : \$ 210,000

2012 : \$ 210,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The University of Sydney

Project Summary

Invasive species pose a major threat to biodiversity worldwide; and within Australia, cane toads are widely viewed as one of the biggest such problems. Building on recent studies that reveal weakened immune systems in invasion-front toads, this project will provide a comprehensive understanding of immune responses in cane toads and native frogs, with the aim of exploiting the toads' immunocompromised state to develop new and more effective control measures. The project will develop a new paradigm about the roles of stress and immunity in biological invasion, applicable to the control of other invasive species and to understanding processes at work when environmental changes force species to shift their ranges.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985137 Prof SJ Simpson; Dr GA Sword; Dr M Charleston; Dr ID Couzin; A/Prof D Raubenheimer

Approved Project Title **Heterarchical modelling of nutritional ecology: from individuals to communities**

2009 : \$ 130,000

2010 : \$ 130,000

2011 : \$ 130,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The University of Sydney

Project Summary

The project will combine advances in nutritional theory, agent-based modelling and landscape ecology to produce a modelling framework with which to understand the interrelationships between the physiology and behaviour of individual organisms and the populations, communities and ecosystems in which they reside. The resulting computational model will provide a major new initiative in quantitative ecology and allow specific practical problems to be addressed in relation to agricultural pests, invasive species, conservation biology and animal production systems.

DP0984407 Prof GA Sluga

Approved Project Title **The International History of Cosmopolitanism and Nationalism, 1814-1822**

2009 : \$ 70,000

2010 : \$ 57,028

2011 : \$ 70,000

2012 : \$ 88,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Sydney

Project Summary

We cannot understand our entrapment in nationalism until we unravel the history of its complex inter-relationship with cosmopolitanism. This project excavates an understanding of politics and community that offers alternatives to the current global impasse. The moment in the past I will study was the origin of our present predicament, namely the inescapability of nationalism for the cosmopolitan and of cosmopolitanism for the nationalist. This project will consolidate the significance of Australian scholarship to a field that is critical to understanding our choices and destinies in a global society. It will make Australia the headquarters of a new international history that investigates the relevance of the past to policy-making.

DP0988227 Dr SG Solomon; Dr DA Protti

Approved Project Title **Inhibitory control of retinal sensitivity**

2009 : \$ 120,000

2010 : \$ 90,000

2011 : \$ 90,000

Primary RFCD 2706 PHYSIOLOGY

Administering Organisation The University of Sydney

Project Summary

We will determine how the nerve cells that carry information from the eye to the brain are always able to provide signals despite very different environments; daylight, fog and night. Knowledge of how nerve cells achieve this rapid learning is important for any understanding of brain function; it is fundamental if we are to develop machines that see or that help restore vision in humans. The project will provide the world's first look at the synaptic physiology that underpins all visual perception, helping to bring Australia back to the forefront of research in this field. This new collaboration between two successful researchers will attract top quality students and researchers from Australia and abroad and be published in major journals.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0984389 Prof CM Stampfl; Dr S Piccinin; Prof MR Scheffler; Prof AJ Freeman

Approved Project Title **First-Principles Engineering of Advanced Multicomponent Materials for Clean, Energy Efficient Thermoelectric and Catalytic Technologies**

2009 : \$ 150,000

2010 : \$ 100,000

2011 : \$ 120,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

Administering Organisation The University of Sydney

Project Summary

The quantum mechanical, first-principles calculations for studying advanced multicomponent materials and surfaces of high current technological interest will produce significant results as well as fundamental knowledge of key mechanisms that will aid in the design and tailoring of new catalytic and thermoelectric materials. The project is directly relevant to the designated priority area - Frontier Technologies for Building and Transforming Australian Industries. It will involve collaboration with leading international experts, thus enhancing Australia's knowledge base and research capacity. This clearly has immediate benefits through the transfer and propagation of cutting-edge knowledge and skills to students and post-docs.

DP0988470 Prof R Stocker

Approved Project Title **Cellular Responses to Adversity: Oxidative Stress and Protection Against Oxidative Damage**

2009 : \$ 106,000

2010 : \$ 99,000

2011 : \$ 99,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Sydney

Project Summary

A deficiency in the protein haem oxygenase-1 causes severe biological consequences in animals and humans. These include decreased reproduction, retarded development, the inability of the body to handle iron, chronic inflammation and increased susceptibility to age-associated diseases. This study will determine how a deficiency of the protein alters cells at the level of genes, proteins and protein functions. By doing so, the project will illuminate how haem oxygenase-1 alters cell functions in a beneficial way. This information will eventually assist in preventing the serious disorders associated with deficiency of haem oxygenase-1. It will also provide the basis for novel treatments to slow down age-associated diseases.

DP0988671 Prof MV Swain; Prof NA Jacques; Dr L He

Approved Project Title **Biomimetic Insights from Enamel: A Nano-mechanical and Nano-structural Investigation of a Natural Ceramic-like Biocomposite**

2009 : \$ 132,000

2010 : \$ 145,000

2011 : \$ 141,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

APD Dr L He

Administering Organisation The University of Sydney

Project Summary

Enamel is a naturally developed example of an optimised material structure that constitutes the hardest tissue in the human body. In addition it is exposed to severe mechanical and environmental challenges and must last the lifetime of the individual and unlike other tissue is unable to heal or repair itself. Understanding the factors controlling the amazing mechanical properties of this tissue will be of great benefit for the design of bio-inspired materials and be important for the development of advanced materials for which Australia already has an enviable reputation.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985052 Prof PP Tam; Dr L Robb

Approved Project Title **Molecular control of embryonic patterning: The function of Rhou gene in mediating response to WNT signalling**

2009 : \$ 142,000

2010 : \$ 142,000

2011 : \$ 137,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

The scientific knowledge gained from this investigation of the early development of embryos will inform us of how the essential building blocks of the body are assembled, and provide insights into the genetic and developmental causes of birth defects. This will benefit the health professionals, the research community, the education sector and the general public, by underpinning the formulation of new research hypotheses, enriching the curriculum and the provision of informed counselling. The embryological expertise developed for this project will enhance the nation's research capability through the sharing of skills and knowledge with a national network of academic and industrial research teams.

DP0986004 Dr R- Torrence; Mrs NA Kononenko; Dr EA Carter

Approved Project Title **Valuing Stones: obsidian stemmed tools in the creation of social complexity in Papua New Guinea**

2009 : \$ 149,000

2010 : \$ 100,000

2011 : \$ 101,000

2012 : \$ 107,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APD Mrs NA Kononenko

Administering Organisation The University of Sydney

Project Summary

New inter-disciplinary research into the manufacture, use and exchange of highly distinctive obsidian artifacts will evaluate proposals that they signify the existence of social differentiation in the Pacific region more than 6000 years ago. The research employs new social theory, replication experiments, use-wear analyses and pioneers Raman spectroscopy to detect geological sources and identify microscopic residues. The study will make a significant contribution to Australian and world scholarship, continue the innovation and leadership of Australian scholars in research on stone tools and prehistoric exchange, and promote goodwill and better diplomacy with Australia's nearest neighbour, Papua New Guinea.

DP0984536 Prof J Trewhella; Prof JM Guss

Approved Project Title **Molecular mechanisms of two-component signal transduction in bacteria**

2009 : \$ 150,000

2010 : \$ 135,000

2011 : \$ 135,000

Primary RFCD 2505 MACROMOLECULAR CHEMISTRY

Administering Organisation The University of Sydney

Project Summary

The focus of this research is on the protein complexes that transmit signals in bacteria to elicit the desired responses to environmental stimuli. Like many dynamic processes in cells, signaling requires proteins that are flexible and hence resistant to high-resolution structural analysis using crystallography. We will make use of new research infrastructure at the Australian synchrotron and OPAL research reactor to overcome the challenges of flexibility in these systems. The proteins we will study are not found in humans, and hence our research will provide important structural data on potential targets for the design of novel antibiotics to fight bacterial infection.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0988336 Dr M Velonaki

Approved Project Title **Physicality, tactility, intimacy: interaction between humans and robots**

2009 : \$ 203,679
2010 : \$ 198,619
2011 : \$ 154,319
2012 : \$ 98,570
2013 : \$ 98,570

Primary RFCD 4103 CINEMA, ELECTRONIC ARTS AND MULTIMEDIA

ARF Dr M Velonaki

Administering Organisation The University of Sydney

Project Summary

Until recently robotics has been regarded as a strictly technological discipline. This research brings a fresh perspective to interactive robotics by investigating new ways that humans and robots can interact physically in socially empowered environments. The knowledge created in the project will advance both interactive media arts and robotics science. The theoretical outcomes of this research will open up an entirely new cross-disciplinary approach to engagement between humans and machines, promoting Australia's growing reputation for innovation and creativity. The practical demonstration of this approach will lead to a new level of advanced robotics capability in applications such as health- and aged-care.

DP0986194 Prof GG Warr; Dr R Atkin

Approved Project Title **Adsorption and Structure at Ionic Liquid Interfaces**

2009 : \$ 160,000
2010 : \$ 110,000
2011 : \$ 110,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Organisation The University of Sydney

Project Summary

Ionic liquids (ILs) have recently emerged as important environmentally-friendly solvents for synthesis, but applications based on their unusual physical properties have been vastly under-exploited. This project will generate significant new fundamental understanding of ILs, and train young researchers in the use of ILs and advanced characterization techniques at honours, postgraduate and postdoctoral levels. The results of this project will enable the development of new or improved technologies by facilitating the use of ILs in specialised products. Examples include novel lubricants, catalytic mediums, surface coatings, nanostructured self-assembled scaffolds and composite materials, nanoparticle synthesis, and drug-delivery systems.

DP0989050 Prof PM Waterhouse

Approved Project Title **Regulation of Plant Development by Small RNAs**

2009 : \$ 250,000
2010 : \$ 240,000
2011 : \$ 230,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Sydney

Project Summary

Understanding the roles of small RNAs and their pathways is a new field of research that is giving, and will continue to give profound insights into how multicellular organisms regulate gene expression at a genomic level. Research in this area has already led to RNA interference technology, by which almost any gene can be switched off, and there is considerable potential for other gene silencing and trait modification technologies to emerge. The project will yield insights into fundamental biological processes which are expected to engender applications in agriculture and biotechnology. It will maintain and enhance Australia's position in this area.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985598 Dr FA White; Dr H Abu-Rayya

Approved Project Title **Cooperative dual identity: A new approach to promote ethnic harmony between Muslim and non-Muslim Australians**

2009 : \$ 45,000

2010 : \$ 20,000

2011 : \$ 35,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Sydney

Project Summary

This project makes a significant contribution to strengthening Australia's social fabric by promoting positive cooperation between Muslim and non-Muslim students. Cooperative contact and dual identity strategies will be innovatively integrated into school curricula using web technology to encourage positive intergroup interactions that are currently not commonplace. Researchers, policy-makers, and teachers will have available a significantly effective long-term ethnic harmony strategy, which will be incorporated routinely into their research and practice. We expect this cutting edge research program to yield timely and influential findings, and advance Australia's position as a leader in the field of social and developmental psychology.

DP0984826 Dr JS Wilkins; Prof PE Griffiths

Approved Project Title **Contemporary scientific explanations of religion: A methodological and philosophical analysis**

2009 : \$ 87,195

2010 : \$ 88,506

2011 : \$ 88,446

Primary RFCD 4401 PHILOSOPHY

APD Dr JS Wilkins

Administering Organisation The University of Sydney

Project Summary

The idea that religion is an evolved feature of human nature plays a key role in the ongoing culture war between those critical of some aspects of the scientific worldview, especially the theory of evolution, and those who take it upon themselves to defend science against the perceived threat of religion, notably the so-called 'new atheist' media stars. Analysing the philosophical and methodological issues raised by naturalistic explanations of religion will clarify the potential relationships between science and religion in a pluralist and predominantly secularist society like Australia in which the claims of science are accorded a special authority.

DP0984267 Dr JY Yang; Dr ME Raimondo; Dr JW Arthur

Approved Project Title **Statistical and computational methods using a multiscale approach for protein identification and quantification**

2009 : \$ 90,000

2010 : \$ 85,000

2011 : \$ 85,000

Primary RFCD 2302 STATISTICS

Administering Organisation The University of Sydney

Project Summary

Proteins are critically important in the onset and ongoing illness associated with disease. Key proteins may serve as markers to diagnose or predict the course of a disease, or even become the target of pharmaceuticals. Accurate, efficient and robust algorithms are a critical component in protein identification. This research provides novel statistical algorithms for protein identification using multiscale analysis techniques. Their applications in the bio-medical field will enable Australian and international researchers to identify key proteins more accurately, than current methods, leading to improve health, medical, and biological research outcomes.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0988564 Dr X Yi
Approved Project Title **Novel coherence-free microwave photonic signal processors.**
2009 : \$ 54,000
2010 : \$ 51,000
2011 : \$ 50,000
Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES
Administering Organisation The University of Sydney

Project Summary

With the unrelenting push for increasing bandwidth requirements, there is an unprecedented challenge to provide high-performance systems for high-bandwidth signal processing. In areas such as fibre-wireless networks, radioastronomy, and defence, it is essential to pre-process the wideband fibre-fed distributed antenna signals. The new coherence-free, high-frequency, low-noise 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.

DP0986551 A/Prof R Zhang
Approved Project Title **Noncommutative geometry in representation theory and quantum physics**
2009 : \$ 90,000
2010 : \$ 90,000
2011 : \$ 80,000
2012 : \$ 90,000
2013 : \$ 100,000
Primary RFCD 2301 MATHEMATICS
APF A/Prof R Zhang
Administering Organisation The University of Sydney

Project Summary

One of the most important problems in natural science is to understand the structure of spacetime at the Planck scale. Mathematical investigations in recent years have predicted that at this scale, spacetime becomes noncommutative. Taking this noncommutativity into account, the project brings together geometry, algebra and quantum mechanics to develop new mathematical theories required for addressing the problem. It promises to make fundamental contributions to both mathematics and theoretical physics.

DP0984402 Dr R Zheng; Dr W Yeoh
Approved Project Title **Microscopic Origin of the Enhanced Flux Pinning in Nano-Doped MgB₂ Superconductors**
2009 : \$ 210,000
2010 : \$ 140,000
2011 : \$ 140,000
Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS
APD Dr W Yeoh
Administering Organisation The University of Sydney

Project Summary

Magnesium diboride (MgB₂) has advantages over other superconductors in terms of high performance and low costs for a wide range of applications, such as superconducting power cables, superconducting magnetic energy-storage devices, transformers, fault current limiters and motors. Besides the apparent economic benefits, the application of superconductivity will significantly reduce the green-house gas emission. This project will advance the practical applications of MgB₂ by understanding the mechanism to improve critical current density.

Summary of Discovery Projects Proposals for Funding to Commence in 2009

DP0985271 Dr BB Zhou; Prof RP Brent

Approved Project Title **An Integrative and Interactive Approach for Co-estimation of Multiple Sequence Alignment and Phylogeny Reconstruction**

2009 : \$ 100,000

2010 : \$ 60,000

2011 : \$ 70,000

Primary RFCD 2803 COMPUTER SOFTWARE

Administering Organisation The University of Sydney

Project Summary

In this project innovative IT methods will be developed to assist biologists to solve complex and important biological problems. Many important applications in computational biology need very accurate and reliable tools for multiple sequence alignment and phylogeny reconstruction. Unfortunately, current existing tools are unreliable and are prone to serious errors when applied to large and divergent biological sequences. The success of this project will not only make significant contribution to the relevant research fields, but also help achieve goals in certain real-life biological research projects which are unique and important to Australia.