

Summary of Discovery Projects Applications for Funding to Commence in 2006

New South Wales

The University of Sydney

DP0666778 A/Prof DW Airey; Prof JP Carter

Approved Project Title **Mechanics of dynamic loading and rapid penetration of soils**

2006 : \$208,000

2007 : \$160,000

2008 : \$180,000

2009 : \$140,000

2010 : \$100,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Institution The University of Sydney

Project Summary

The project will produce improved understanding and new numerical tools that will permit cost effective simulation and modelling of rapid penetration of objects into the ground, and of the compaction processes used on the majority of construction sites. The free fall penetrometer will be developed to enable soil strength to be determined at remote sites, e.g. ocean seabed, jungles, swamps. The project will also assist in the selection of compaction equipment and procedures.

DP0666148 A/Prof R Aldrich

Approved Project Title **Province, Nation, Empire: France, 1871-1940**

2006 : \$65,000

2007 : \$25,000

2008 : \$40,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution The University of Sydney

Project Summary

This project will deepen understanding of structures of political, strategic and economic power by providing insight into the dynamics of regionalist, nationalist and internationalist ideologies through study of the world's second largest overseas empire. It examines the role of non-state initiatives and pressures, while also investigating the colonial origins of contemporary globalisation. It will shed light, in particular, on the post-colonial heritage of actions in countries of the Asia-Pacific region that were French colonies or that remain French overseas outposts.

DP0666692 Prof SM Andrews

Approved Project Title **Lexical expertise and reading skill: An experimental analysis of individual differences in written language proficiency**

2006 : \$62,500

2007 : \$67,400

2008 : \$72,600

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Sydney

Project Summary

The Federal Government's current National Inquiry into the Teaching of Literacy highlights the importance of an evidence-based approach to teaching and assessing literacy. Considerable research and policy effort has been directed towards early reading programs. Much less attention has been paid to evaluating children's later development of reading comprehension and spelling proficiency, but there is wide diversity in these skills within the adult population that influence educational and vocational opportunity. This investigation of the factors underlying expertise in reading and spelling will provide evidence that can contribute to developing educational policy and curricula for the later stages of schooling.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664524 A/Prof SW Armfield; Prof JC Patterson

Approved Project Title **Stability, transition and heat transfer in thermally coupled natural convection boundary layers**

2006 : \$220,000

2007 : \$170,000

2008 : \$180,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Institution The University of Sydney

Project Summary

Thermally coupled natural convection systems occur when a conducting vertical wall separates two fluids at different temperatures. Such configurations occur, for example, at a window separating the interior of a room from the outside or when a container of fluid is placed in a refrigerator. Improved building heating/cooling and ventilation, and more efficient refrigeration systems, require a thorough understanding and predictive capability for these flows. This project will develop experimental, numerical and analytic tools to predict these flows and provide simple scaling relations for bulk flow parameters such as the heat transfer across the wall, which will be of immediate use in the associated industries.

DP0663351 Dr DH Arnold; Prof A Johnston

Approved Project Title **Motion and Spatial Coding in Vision**

2006 : \$120,000

2007 : \$100,000

2008 : \$100,000

Primary RFCD 3801 PSYCHOLOGY

APD Dr DH Arnold

Administering Institution The University of Sydney

Project Summary

The results of this project will have implications for the design and implementation of artificial visual systems. Completion of this project will depend upon international collaboration - forging links between a young Australian investigator and outstanding overseas scientists as well as providing excellent training opportunities. Subsequent publication of the research in top-ranking international journals will further promote Australian science abroad.

DP0664618 Prof HE Astor

Approved Project Title **Managing Conflict in Higher Education**

2006 : \$42,000

2007 : \$20,000

Primary RFCD 3903 JUSTICE AND LEGAL STUDIES

Administering Institution The University of Sydney

Project Summary

Disputes in Australian universities attract extensive publicity that damages the national and international reputation of Australian universities in the local and global marketplace. Litigation and other costs amount to millions of dollars. This money could be better spent on universities' core business of teaching and research. This project will use new developments in alternative dispute resolution to help Australian universities resolve disputes more effectively. It will focus on methods of resolving disputes that save costs but are also appropriate for disputes involving important issues such as academic freedom.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663046 Mr F Aubret

Approved Project Title Does adaptive plasticity play a significant role in the initial colonisation of novel habitats?

2006 : \$145,000

2007 : \$115,000

2008 : \$115,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APD Mr F Aubret

Administering Institution The University of Sydney

Project Summary

An increased understanding of the evolutionary and ecological processes responsible for generating Australian biodiversity can facilitate effective management and conservation of this unique resource. Islands are especially significant in this context because they host many kinds of distinctive fauna and flora that have vanished from mainland habitats. It is therefore crucial to understand the biology of these small isolated systems, as a way to preserve those unique systems as well as the distinctive evolutionary processes that occur within them.

DP0664663 Dr GR Barnes; Prof MB Clunies Ross

Approved Project Title Writing from the edge of the world: medieval Icelandic literature and the quest for social identity

2006 : \$94,092

2007 : \$72,923

2008 : \$91,157

Primary RFCD 4202 LITERATURE STUDIES

Administering Institution The University of Sydney

Project Summary

This project has special significance for Australians. Iceland and Australia are both geographically isolated communities, both originally colonies of larger political powers (Norway and Britain), both asserting a social identity different from that of the motherland. Many themes of medieval Icelandic literature have parallels in Australian culture; slogans like 'the cultural cringe', 'the lucky country', 'home and away' can be readily paralleled in Old Icelandic literature. Our study will be of considerable social benefit to Australia and will show how another ex-colony, remote in time and place, constructed its own social identity.

DP0664374 Dr S Belmessous

Approved Project Title Assimilation and Empire

2006 : \$85,000

2007 : \$85,000

2008 : \$90,000

Primary RFCD 4301 HISTORICAL STUDIES

APD Dr S Belmessous

Administering Institution The University of Sydney

Project Summary

There are growing calls internationally for the integration of immigrant communities as a long-term means of combating terrorism. Through an understanding of the history of assimilation, this project provokes considerable scepticism concerning the current resurgence of assimilationist sentiment. The politics of culturally diverse societies are profound but they are not going to be solved by simplistic diagnosis. The politics of assimilation is not the solution to contemporary terrorism but part of the problem. Thus at the heart of this project lie concerns which directly address the National Research Priority, Safeguarding Australia.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665687 Dr K Belov; Dr M Eldridge; Dr S Beck

Approved Project Title **Characterization of the tammar wallaby MHC**

2006 : \$80,000

2007 : \$70,000

2008 : \$70,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Sydney

Project Summary

We will be able to determine the immunological fitness of marsupial populations which will help us to conserve our native fauna and protect our eco-tourism industry.

We will work in the international arena of large scale genomics and bring new technologies to Australia.

DP0666279 A/Prof BJ Bennett; A/Prof WA Rogers; Dr IA Karpin

Approved Project Title **Gender Inequities in Health Research: Towards a New Regulatory Framework**

2006 : \$100,000

2007 : \$150,000

2008 : \$50,000

Primary RFCD 3901 LAW

Administering Institution The University of Sydney

Project Summary

This project will benefit Australian women by identifying better and fairer ways for the legal system to ensure that health research performed in Australia provides meaningful information about the significance of new health treatments for Australian women. The research undertaken in this project will make recommendations for the development of Australian laws and policies that will promote and maintain good health by encouraging equal participation of men and women in health research and analysis by gender of research results. This is particularly important given the ageing of the Australian population and the greater longevity of women compared to men.

DP0665689 Prof MR Bennett; A/Prof WG Gibson

Approved Project Title **Mechanism of transmission of calcium waves by glial cells**

2006 : \$100,000

2007 : \$82,000

2008 : \$82,000

Primary RFCD 2705 ZOOLOGY

Administering Institution The University of Sydney

Project Summary

This research concerns determining the fundamental properties of cells that occupy about 70% of the brain, the glial cells. Two very important discoveries on glial cells have recently been made, namely that they can convey information in the form of patterns of waves and that they possess molecules on their surface membranes that have been implicated in psychotic disorders. One such molecule is called the D2 receptor and its malfunctioning has been implicated in schizophrenia. Our research will determine the way in which information is propagated in the glial system of the brain and also illuminate the function of several of the molecules found on the surface of the glial cells.

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DP0666883 Prof MM Bilek; Dr SH Lim; Dr A Anders; A/Prof I Yarovsky

Approved Project Title **Design and synthesis of transparent conducting metal oxides**

2006 : \$200,000

2007 : \$160,000

2008 : \$160,000

2009 : \$160,000

Primary RFCD 2914 MATERIALS ENGINEERING

APD Dr SH Lim

Administering Institution The University of Sydney

Project Summary

With advances in solar cell and flexible display technologies the demand and performance requirements for transparent conductors used as electrodes in these devices will increase dramatically. This research program is focused on developing new materials to meet the demand and the challenges of new, more advanced technologies. The project has the potential to generate valuable intellectual property in the form of new generation transparent conducting oxide materials for a rapidly growing set of applications. The new devices will directly improve our standard of living and additional economic benefits will come from commercialisation of the technology both here and overseas.

DP0663776 Dr D Braddon-Mitchell; Dr AL Roskies; Dr U Kriegel; Dr C West

Approved Project Title **Personal Identity, Consciousness and Agency**

2006 : \$120,000

2007 : \$100,000

2008 : \$100,000

Primary RFCD 4401 PHILOSOPHY

APD Dr AL Roskies

Administering Institution The University of Sydney

Project Summary

If I lose my memory, am I the same person I used to be? If much of my body or brain is replaced, do I remain the same person? What if my beliefs and attitudes are altered: does this affect who I am? These are questions of personal identity, and they have enormous bearing on questions of public ethics, especially in the light of biomedical changes. Our inter-disciplinary solutions will add both nuance and insight to the difficult decisions the community will face in this area. The project brings to Australia two leading young researchers from the United States, thus substantially enhancing Australia's skill base and international profile.

DP0665330 Dr MS Byron

Approved Project Title **Textual Ontogeny and the Understanding of Modernist Texts: A Case Study of Samuel Beckett's Novel, Watt**

2006 : \$59,557

2007 : \$63,936

2008 : \$61,147

2009 : \$55,755

Primary RFCD 4202 LITERATURE STUDIES

APD Dr MS Byron

Administering Institution The University of Sydney

Project Summary

This research develops smart technology use: by creating a new method of literary editing that is best able to extend the capabilities of electronic text, this project enhances the understanding of modernist literature and the ability to use technology in innovative ways in the humanities. New ways to organise and edit complex networks of data and documentation (in this case extensive archival and published material) will be transferable to a wide variety of non-literary applications.

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DP0665743 Dr MG Chapman

Approved Project Title Identifying and creating essential habitat for rare Australian intertidal molluscs

2006 : \$40,000

2007 : \$60,000

2008 : \$39,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution The University of Sydney

Project Summary

Coastal development in Australia causes major changes to natural habitats. Obligations to conserve biodiversity are impossible without reliable information about how animals respond to habitat and how best to restore damaged habitat. Current management treats habitats as large-scale units and ignores fine-scale use of habitat by animals. This project will provide essential understanding to guide policy about coastal conservation, by providing ecologically realistic understanding of associations between rare invertebrates and habitat. New protocols to measure these associations and success of restoration, will be applicable to any rare species in any complex habitat, increasing present capabilities for conservation.

DP0666848 Prof R Charteris

Approved Project Title Transformations from Renaissance to Baroque: The Cultural and Musical Significance of Giovanni Gabrieli

2006 : \$43,626

2007 : \$46,779

2008 : \$48,074

2009 : \$49,697

2010 : \$51,400

Primary RFCD 4101 PERFORMING ARTS

Administering Institution The University of Sydney

Project Summary

The Western European tradition forms a significant part of Australia's culture, and it is important that Australians are contributors to the extension of this tradition as well as being consumers. This project will discover new music and materials that will be of immense interest to many Australians, and it will make its discoveries known in an accessible way that meets the demand in Australian society. My leadership in Renaissance music studies, especially Gabrieli, is contributing to Australia's involvement in the dynamic, international revival of early music, as well as facilitating telecasts, broadcasts, concerts and recordings.

DP0665169 Dr M Chen; Dr TS Bibby; Prof AW Larkum; Prof RE Blankenship

Approved Project Title Novel Chlorophylls and New Directions in Photosynthesis

2006 : \$160,000

2007 : \$130,000

2008 : \$130,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

APD Dr TS Bibby

Administering Institution The University of Sydney

Project Summary

Understanding how solar energy is used in photosynthesis is of global importance and will contribute to cutting-edge photosynthetic research by Australian scientists. We aim to discover how and why the key photosynthetic pigments, chlorophylls, are synthesised and used; this will provide new opportunities for breakthroughs in frontier technologies, such as photoelectric cells based on carbon rather than silicon. We aim to understand how novel chlorophylls are used in a variety of important organisms in a range of ecological niches. The results will aid understanding of the effects of global climate change on coral reefs, in open-ocean systems and in other important biological communities.

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DP0664922 Dr SJ Cordwell

Approved Project Title **Characterising post-translational modifications in bacterial proteins**

2006 : \$88,000

2007 : \$75,000

2008 : \$75,000

Primary RFCD 2703 MICROBIOLOGY

Administering Institution The University of Sydney

Project Summary

This project represents the first global attempt to characterize post-translational modifications in bacterial proteins using the tools of proteomics. Modifications to proteins are key elements in altering their function. In bacteria, modifications are important in cell-cell adhesion, signalling and triggering of the immune response. Characterisation of modified proteins and their sites of modification represents an opportunity to understand how bacterial cell populations communicate in the environment, as well as aid in understanding pathogenesis in medical, veterinary and food-borne pathogens. Therefore, improved vaccine targets and therapeutics, as well as method-based products, may be generated by this project.

DP0666615 Dr SM Croom

Approved Project Title **Quasar Cosmology**

2006 : \$120,000

2007 : \$145,000

2008 : \$145,000

2009 : \$145,000

2010 : \$120,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

QEII Dr SM Croom

Administering Institution The University of Sydney

Project Summary

This project will address fundamental issues regarding the formation and evolution of galaxies and super-massive black holes. It will build on Australia's international reputation as a centre of excellence in astronomy. The project will capitalize on new instrumentation technology being developed in Australia as well as opening the door for Australian access to international facilities. We will train a number of students who will be enabled with a powerful set of analytical and information technology skills. We will publicize our work to inspire young Australians towards studies in the areas of science and technology.

DP0665973 Dr JR Curran; Dr T Murphy

Approved Project Title **Exploring Scientific Information with Advanced New Search Tools**

2006 : \$60,000

2007 : \$60,000

2008 : \$60,000

2009 : \$60,000

Primary RFCD 3802 LINGUISTICS

APD Dr T Murphy

Administering Institution The University of Sydney

Project Summary

The rapidly growth of scientific literature in many fields makes finding information a challenge. For example, biologists produce over 1 million articles each year. Existing search tools have only limited success satisfying the demands of scientists' queries. This project will deliver intelligent e-research assistants capable of answering scientists' questions directly rather than returning a list of documents. This will allow scientists to more efficiently exploit the literature enabling them to be more innovative and productive. This technology is applicable where ever finding facts in large volumes of text is critical, e.g. analysing surveillance material. Advanced search tools will have considerable academic and industrial impact.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665402 Prof IS Curthoys; Dr HG MacDougall; Dr ST Moore

Approved Project Title **Functional Assessment of Head-eye Coordination during Driving**

2006 : \$90,000

2007 : \$85,000

2008 : \$80,000

Primary RFCD 3801 PSYCHOLOGY

APD Dr HG MacDougall

Administering Institution The University of Sydney

Project Summary

238 people per 100,000 population were hospitalized and 9 people per 100,000 died as a result of road-transport related injury in Australia in 2002. We will address this issue by assessing the head eye coordination strategies for young drivers, for proficient drivers and for aged drivers to determine those behaviors and strategies that are associated with various levels of performance. This insight could be affectively communicated to others and would provide the basis for educational material and methods that would improve operator skill, safety, and performance. These individual improvements would provide overall benefits such as improved transport efficiency, reduced accident rates, saved lives and a reduction in related social costs.

DP0666110 Dr K da Costa

Approved Project Title **Drawing the line: the archaeology of Roman provincial borders in Late Antique Palaestina and Arabia (AD250 - 650)**

2006 : \$109,000

2007 : \$74,000

2008 : \$84,000

2009 : \$66,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APD Dr K da Costa

Administering Institution The University of Sydney

Project Summary

This project, using archaeological evidence from Jordan, will for the first time accurately establish the boundaries of provinces in the Roman Empire. By linking Australia and the Middle East in international scholarly research dealing with our common cultural heritage, it will increase our mutual understanding. The examination of very long-term trends in an ancient system which dealt with a complex, multi-cultural population will provide much needed comparative illustrations for the current national debate on the nature and security of Australian borders. It will also provide evidence of long-term economic change and its political consequences.

DP0667031 Prof RA Dampney; A/Prof RM McAllen

Approved Project Title **Central command neurons integrating cardiorespiratory drive in exercise**

2006 : \$100,000

2007 : \$65,000

2008 : \$65,000

Primary RFCD 2706 PHYSIOLOGY

Administering Institution The University of Sydney

Project Summary

The ability to perform exercise is fundamental to human health and welfare. This ability depends upon the co-ordination by the brain of respiratory and cardiovascular function, such that the delivery of oxygen to exercising muscles is maximised. This project will test the idea that there is a specific group of neurons in the brain that drive both the respiratory and cardiovascular changes that occur during exercise, and will determine the location and functions of such neurons. Such new knowledge will help us understand how the brain optimises the ability of the body to perform exercise. This is of fundamental importance in sports science, a field in which Australia excels.

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DP0663967 Prof MJ Davies; Prof PJ Barter; Dr MD Rees

Approved Project Title **Mechanisms and consequences of oxidation of glycosaminoglycans, proteins and proteoglycans by myeloperoxidase-derived oxidants**

2006 : \$132,000
2007 : \$110,000
2008 : \$110,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY
APD Dr MD Rees

Administering Institution 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.

DP0665627 Prof BJ Eggleton; Prof CM de Sterke

Approved Project Title **Efficient and tailored supercontinuum generation using dispersion management**

2006 : \$254,684
2007 : \$193,766
2008 : \$192,778
2009 : \$201,516

Primary RFCD 2404 OPTICAL PHYSICS

Administering Institution The University of Sydney

Project Summary

Imagine a laser beam, but not with just one colour, but containing all colours. The light beam thus looks white, somewhat like a search light, except that it is much brighter. We now know how to generate such bright white beams of light, but it is expensive, requiring a small specialized laboratory full of equipment. Through a better understanding, we will make it easier and cheaper to generate these light beams. All kinds of applications that have been known for years, such as medical imaging and chemical analysis, then suddenly become practical. We anticipate that in the future these bright white light beams will be used on a routine basis in Australian hospitals and industry.

DP0664830 Prof D Feng; Dr S Eberl; A/Prof M Fulham

Approved Project Title **Information Technology Aided Diagnosis of Dementia with PET-CT Imaging**

2006 : \$141,000
2007 : \$111,473
2008 : \$115,473
2009 : \$132,000
2010 : \$135,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Institution The University of Sydney

Project Summary

Dementia is a significant health problem and approximately 162,000 Australians currently suffer from this disease, with costs estimated at \$6 billion annually in Australia and a profound effect on the lives of carers and family members. With the ageing of the Australian population, the patient number is expected to rise to 500,000 by 2040. This research will apply innovative IT approaches to develop computer assisted diagnosis of early dementia, when treatment is possible, from combined functional and anatomical imaging modalities (PET-CT). This will not only add considerable value to Australia's medical imaging infrastructure and smart use of information, but will ultimately also deliver substantial benefits to our nation and community.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663477 A/Prof TC Fisher; Prof K Sengupta

Approved Project Title **An Economic Analysis of Bankruptcy and Financial Reorganization in Australia**

2006 : \$90,000

2007 : \$32,000

2008 : \$20,248

Primary RFCD 3401 ECONOMIC THEORY

Administering Institution The University of Sydney

Project Summary

We examine the question of whether the new Australian bankruptcy law is too lenient on firms in financial trouble. We will assemble detailed economic data on a large number of bankrupt firms and use the data to measure the performance of the Australian bankruptcy system. The outcome will be a more complete understanding of how bankruptcy law saves viable firms and eliminates inefficient firms. The project will assist policy-makers designing bankruptcy law. The national benefit will be a bankruptcy system that balances the need to give innovating entrepreneurs a second chance against the danger of encouraging too many unprofitable firms to limp on and waste resources.

DP0666484 Prof SC Fleming

Approved Project Title **Low energy all-optical logic gates with improved cascadability and fan-out for future optical communications and signal processing systems**

2006 : \$120,000

2007 : \$120,000

2008 : \$105,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Institution The University of Sydney

Project Summary

All-optical logic processing is the key to overcoming electronic bottlenecks in high-speed communication networks as single-channel speeds exceed electronic capabilities. This research will build off and extend Australia's world leading specialty fibre and fibre device capabilities and place Australia at the forefront in the international all-optical digital information-processing race. High quality research publications will enhance Australia's strong research reputation in photonics and advanced materials and promote international collaboration. New optical processing capabilities will benefit other application areas such as sensing and security.

DP0663519 A/Prof RR Fulton; A/Prof SR Meikle; Prof RB Banati

Approved Project Title **Enabling Technologies for Motion Corrected Positron Emission Tomography (PET) of Unanaesthetized Laboratory Animals**

2006 : \$163,000

2007 : \$121,000

2008 : \$124,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Institution The University of Sydney

Project Summary

Small animal molecular imaging is a powerful tool in biological research and drug discovery. Anaesthesia is routinely used to avoid motion distortion, but can profoundly alter the biological process studied. This research will enable quantitative imaging of neurobiological phenomena in awake laboratory animals. It will create new opportunities for Australian basic researchers to use innovative technology with expected high economic potential, and benefit small biotech companies by facilitating pre-clinical and clinical development of new pharmaceuticals. The new motion tracking and image reconstruction technologies developed will strengthen Australia's leading position in engineering and biomedical systems development.

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DP0664046 Dr O Gal

Approved Project Title **The imperfection of the Universe: Music, Mathematics, Technology and the (dis-)Order of Nature in Baroque Science**

2006 : \$120,000

2007 : \$30,000

2008 : \$90,000

Primary RFCD 3706 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE

Administering Institution The University of Sydney

Project Summary

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

DP0665045 Prof MJ Gatens

Approved Project Title **George Eliot: Literature as Experimental Philosophy**

2006 : \$115,000

2007 : \$100,000

2008 : \$100,000

2009 : \$100,000

2010 : \$100,000

Primary RFCD 4401 PHILOSOPHY

APF Prof MJ Gatens

Administering Institution The University of Sydney

Project Summary

This project aims to make significant and innovative contributions to research excellence in philosophy, history of ideas and literary studies. In addition it aims to provide a new conceptual framework and concepts necessary for constructive debate on current moral and social issues, many of which are complex legacies from Victorian thinkers, such as Eliot and her contemporaries. The overarching aim of rendering philosophy more inclusive and relevant is vital to the maintenance of a healthy, free and democratic public culture in contemporary Australia.

DP0665360 Prof RG Gilbert

Approved Project Title **Molecular archaeology: new knowledge from molecular weight distributions of synthetic and natural polymers**

2006 : \$194,000

2007 : \$124,000

2008 : \$124,000

Primary RFCD 2505 MACROMOLECULAR CHEMISTRY

Administering Institution The University of Sydney

Project Summary

This project will lead to new understanding of how natural and synthetic polymers are formed. Examples are the enzymatic processes that produce the subtle architecture of rice grains, and the processes that pose problems for developing new techniques for making novel polymer-based materials. The fundamental scientific knowledge from this project will provide a platform for the future development of improved materials, and for superior grain varieties for food and industrial use. These advances will be of significant benefit to Australian industry and consumers.

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DP0663764 Prof GJ Gill

Approved Project Title **Rites of Power: Symbolism, Ritual and Politics in the Soviet Union and Russia**

2006 : \$150,000
2007 : \$148,000
2008 : \$148,000
2009 : \$141,000
2010 : \$120,000

Primary RFCD 3601 POLITICAL SCIENCE
APF Prof GJ Gill

Administering Institution The University of Sydney

Project Summary

In the last fifteen years, Russia has undergone major political change associated with the collapse of the USSR. One of the most important tasks of the new regime is to establish a sense of its legitimacy, which should in turn help to shape its future. As a major player in global politics and a significant power in the Asia-Pacific region, Russia's internal development has important consequences for Australia and the world. Only by understanding Russia and what is happening inside it can Australia adequately deal with and interact with it. This project will substantially further such understanding.

DP0667065 Dr G Gottwald; Dr MJ Breakspear

Approved Project Title **Nonlinear Time Series Analysis in Cardiac Physiology**

2006 : \$80,000
2007 : \$67,000
2008 : \$69,000

Primary RFCD 2301 MATHEMATICS

Administering Institution The University of Sydney

Project Summary

We will develop innovative mathematically-based diagnostics with potentially significant savings in mortality and quality of life for affected individuals and health care costs to the community.

Cardiac diseases kill more Australians than any other disease group. According to the National Heart Foundation the prevalence to heart conditions increased by 18% over the last decade.

Medical practitioners are in need of reliable diagnostic tools to decide whether a person in front of them is at high risk from developing sudden cardiac death, and whether they should be fitted with an implant that could save their life.

DP0666642 Prof SJ Gray; Dr RD Morris

Approved Project Title **Global convergence to International Financial Reporting Standards : factors explaining compliance with and impact of changing standards**

2006 : \$55,000
2007 : \$40,000
2008 : \$50,000

Primary RFCD 3501 ACCOUNTING, AUDITING AND ACCOUNTABILITY

Administering Institution The University of Sydney

Project Summary

The major benefit of this research is that it assesses the extent to which Australia's epoch-making switch to International Financial Reporting Standards in 2005 has been successful in practice relative to similar developments in the EU and elsewhere. Further, the research measures the actual quantitative impact of the change in accounting standards to assess whether or not the change has been significant from the standpoint of making international comparisons of Australian corporate performance. Thus important evidence is provided about the outcomes of Australia's global convergence initiative, how we compare with our major trading partners, and the key change factors involved.

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DP0665867 A/Prof AJ Green; Prof EM Sadler

Approved Project Title **Neutral hydrogen and galaxy assembly in the distant Universe**

2006 : \$178,000

2007 : \$168,000

2008 : \$120,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Institution The University of Sydney

Project Summary

This research will produce a snapshot of hydrogen gas in the Universe 6-7 billion years ago. These results, together with galaxy formation models, will tell us how galaxies are assembled to make the beautiful spirals we see today. This project is only possible because of rapid advances in programmable chip technology, part of the massive increase in the speed and complexity of integrated circuit devices.

DP0665282 Dr JM Guss; Dr MJ Maher

Approved Project Title **The structure and function of dihydroorotase - an enzyme essential for pyrimidine biosynthesis**

2006 : \$86,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

Malaria has recently re-emerged as one of the major life threatening diseases worldwide. With increasing travel and climate change, malaria is increasingly endangering Australians at home and abroad. Our work aims to provide the basis for the rational design of a new class of anti-malarial drugs by the systematic and thorough analysis of an essential enzyme in the malarial parasite.

DP0666241 A/Prof GJ Hage

Approved Project Title **The Western Nation-State, Cultural Pluralism and the Transnational Circulation of Political Emotions in the Shi'a Lebanese Diaspora**

2006 : \$93,000

2007 : \$51,000

2008 : \$52,000

Primary RFCD 3703 ANTHROPOLOGY

Administering Institution The University of Sydney

Project Summary

At its most general level, this research aims to expose and explain the importance of emotions in the formation of all cultures. In so doing it opens the way for a more complex understanding of some of the invisible but important forces that shape intercultural relations within culturally plural nations. It will thus open the possibilities for ameliorating and refining government policies concerned with the management of pluralism. At a more particular level, the research hopes to produce critical knowledge about diasporic Arab Muslim cultures that will ameliorate the thorny relations these cultures have today with western governments.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665794 Prof TW Hambley; A/Prof M Kassiou

Approved Project Title **Functionalised MMP Inhibitors as Radiodiagnostic, Radiotherapeutic, and Radiation-Sensitising Agents for Metastatic Cancer**

2006 : \$92,000
2007 : \$130,000
2008 : \$120,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Institution The University of Sydney

Project Summary

Identifying and treating malignant cancers is one of the major challenges facing the scientific and medical communities. In order to minimise side effects that accompany most treatments of cancer it is necessary to find ways of targeting the therapy to tumours and away from healthy organs. A difference between tumours and healthy tissues is the amount of the proteins (called MMPs) that tumours use to break out of their surroundings, to break into and out of the blood system, and to establish new colonies of cancer cells or metastases. This difference also distinguishes the most aggressive cancers. The purpose of this project is to develop means of identifying and targeting cancers using molecules that bind to these MMP proteins.

DP0664053 Prof MM Harding

Approved Project Title **Synthesis and Applications of Antifreeze Proteins and Glycoproteins**

2006 : \$140,000
2007 : \$130,000
2008 : \$130,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution The University of Sydney

Project Summary

Many cells are damaged when they are chilled below body temperatures thus limiting shelf-life for applications. For example, storage of human blood platelets is limited to 5 days at 22 degrees. This research will produce molecules that can be used in the fields of agriculture (in vitro fertilization techniques, development of improved blood lines), aquaculture and human reproductive technologies, where ice crystal growth and freezing are damaging. This outcome will be achieved by the synthesis of molecules that mimic natural products that allow fish to survive in the icy Arctic and Arctic Oceans and study how they are able to protect cells and tissues from damage in these extreme environments.

DP0666488 Dr AT Harris

Approved Project Title **Selective generation of hydrogen from biomass and waste fuels**

2006 : \$100,000
2007 : \$80,000
2008 : \$80,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Institution The University of Sydney

Project Summary

Biomass fuels account for 14% of global energy supply. This is likely to increase in future as the population increases, energy demand rises, cheap oil and coal reserves are depleted, and the effects of global warming become more readily visible. In Australia the development of a sustainable hydrogen economy is a national priority. The hydrogen economy could bring about improved energy security, substantially reduced greenhouse gas emissions, improved energy efficiency and improved air quality. This proposal directly addresses this challenge by investigating the science underpinning a large-scale sustainable hydrogen synthesis process using biomass and waste fuels.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663086 Dr J Harris; Dr CW Clifford

Approved Project Title Interactions between vision and touch

2006 : \$130,000
2007 : \$100,000
2008 : \$110,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Sydney

Project Summary

This project will investigate in detail how sensory information is integrated across different modalities in constructing our perceptual experiences. This has the potential to be incorporated into the development of virtual reality-type computer-based technologies. The project will link the research activities of two successful Australian researchers, further developing their new and promising collaboration. The research programme will attract high quality local and international students for training in basic psychology research in Australia. The publication of this research in top ranking international journals will promote Australian science abroad.

DP0665739 Dr BR Henderson

Approved Project Title Characterisation of APC intracellular trafficking pathways

2006 : \$91,000
2007 : \$84,000
2008 : \$84,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

This is a fundamental research project aimed at addressing the cell biology of the APC tumour suppressor protein. APC gene mutations are directly linked to the development of colorectal cancer, a serious healthcare issue in Australia with approximately 12,400 new cases diagnosed each year and around 4,700 deaths. The severity of cases in men and women who develop colorectal cancer makes this a socio-economically serious health issue, and our project falls within the Research Priority 2: Promoting and Maintaining Good Health. If successful our project will identify localisation patterns and pathways of movement of APC within cells, which could ultimately help in development of treatments.

DP0665461 Prof JG Hill; Prof RS Thomas; Prof RW Masulis

Approved Project Title The Subversion of Contemporary Performance-Based Pay - A Comparative Australian-US Study

2006 : \$80,000
2007 : \$65,000
2008 : \$65,000

Primary RFCD 3901 LAW

Administering Institution The University of Sydney

Project Summary

The key national benefit from the project will be the development of a more informed basis for analysing, and making policy and regulatory decisions about executive remuneration, which is a matter of great community concern in Australia. The project will assess key provisions in Australian and US executive contracts, providing important comparative information about the structure and operation of performance-based pay schemes. The project will also examine whether systemic problems exist in executive remuneration, The results will assist policy analysts in identifying directions for legal reform, to address problems of non-alignment of interests in executive remuneration, thereby achieving fairer outcomes.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664098 Dr SD Jackson

Approved Project Title **The creation and optimisation of new optical fibres and novel diode-pumped fibre lasers for applications in medicine, defence and the environment**

2006 : \$113,000

2007 : \$101,000

2008 : \$121,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Institution The University of Sydney

Project Summary

The project will widen Australian laser research and contains the important steps required to progress beyond the recent demonstrations of super high power and ultra-compact mode-locked operation. The proposed fibre lasers are internationally significant, will address many applications and will keep Australia at the leading edge of laser and optical fibre research. The array of new technologies necessary for the development of the proposed lasers will be vitally important to Australia's high technology industries.

DP0663330 Dr CT Jin; Dr FA van Schaik

Approved Project Title **Broadcasting 3D Audio: Recording, Transmission, and Playback**

2006 : \$208,000

2007 : \$106,000

2008 : \$86,000

2009 : \$90,000

2010 : \$90,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

QEII Dr CT Jin

Administering Institution The University of Sydney

Project Summary

With the current state of the art, a performance at the Sydney Opera House cannot be recorded and broadcast such that you can listen to it as if you are in the best seat of the house. The goal of our project is to develop the ultimate form of multi-channel audio broadcasting to create this experience. We will develop and implement effective systems for recording, broadcasting and playback of 3D audio in three different scenarios: individual headphone reproduction; small loudspeaker array reproduction; and large loudspeaker array reproduction. We will create optimal recording techniques and broadcasting software for each of these playback techniques.

DP0667314 Dr IN Johnston

Approved Project Title **Central nervous system cytokines and morphine analgesia**

2006 : \$60,000

2007 : \$50,000

2008 : \$50,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Sydney

Project Summary

Morphine remains the drug of choice for the management of moderate-to-severe pain, however its clinical effectiveness is compromised by the fact that morphine's analgesic (pain reducing) efficacy becomes less effective the more it is administered.. This project will examine how analgesic tolerance develops from a completely new approach: Namely, how stimulation of the immune system within the central nervous system is a crucial factor in the development of tolerance. Modulation of analgesia by the immune system has not been systematically studied and provides a potentially fertile ground for the development of new techniques in the management of clinical pain.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665065 Dr MJ Jordan; Prof MA Collins; Prof MS Gordon

Approved Project Title **The First Chemically Accurate Tools in Theoretical Materials Research**

2006 : \$140,000
2007 : \$125,000
2008 : \$125,000
2009 : \$125,000
2010 : \$125,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY
ARF Dr MJ Jordan

Administering Institution The University of Sydney

Project Summary

Non-metallic materials are widely used in catalytic, separation and sensing applications. This project will create a new, accurate, general and systematic approach to the computational study of non-metallic materials and will provide an enormous step forward in our ability to design these materials for specific applications. With ever increasing demand, growing world population and shrinking natural resources, the benefits of such rational materials design impact on the development of new, safer, more efficient, reusable materials in chemical, engineering, electronic and biological applications.

DP0664624 Prof N Joshi

Approved Project Title **New Directions in Non-linear Mathematical Asymptotics**

2006 : \$88,000
2007 : \$78,000
2008 : \$80,000

Primary RFCD 2301 MATHEMATICS

Administering Institution The University of Sydney

Project Summary

Major challenges such as predicting epidemics or modelling cancer rely on our understanding of simple mathematical models with extremely complicated solutions. The first and only model in the literature to reproduce the three-phase cycle of immune response in HIV/AIDS was based on cellular automata. Its results are extremely sensitive to infinitesimally small changes in parameters. Yet, no technique exists to study such variation in cellular automata. This research will provide new methods for prediction and analysis of such models.

DP0665599 A/Prof DT Kenny; Dr CW Thorpe

Approved Project Title **Providing a theoretical and empirical foundation for the role of technical practice in the acquisition of musical mastery**

2006 : \$55,000
2007 : \$45,000
2008 : \$45,000

Primary RFCD 4101 PERFORMING ARTS

Administering Institution The University of Sydney

Project Summary

Cecilia Bartoli, world-renowned mezzo-soprano, credits her phenomenal vocal technique to daily individual attention from her teacher. Such intensive individualised attention is financially impossible for most musicians so the value of teacher contact hours must be maximised through evidence-based, self-directed technical practice (TP). This multidisciplinary project will apply world-leading technology to discover the principles of TP required for vocal mastery. By using these principles, teachers and performing arts institutions can maximise the effectiveness of musical instruction in a financially cost effective way, thereby consolidating our place as a world leader in musical performance and in performing arts research.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664834 A/Prof CJ Kepert

Approved Project Title **Molecular Framework Materials: Nanoporosity and Anomalous Thermal Expansion**

2006 : \$148,000

2007 : \$123,000

2008 : \$130,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Institution 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 assembly of molecular materials that have entirely new and highly useful properties, namely, nanoporosity and anomalous thermal expansion. This innovative work will lead to important fundamental advances in nanoscience and will forge deep understandings of how materials properties relate to nanoscale structure. These advances will spur a wide range of important new technologies, with application of the materials in molecular separations and sensing, clean energy storage, electronics and photonics.

DP0666152 Dr AM Kesson; Prof NJ King

Approved Project Title **Regulation of MHC-I and ICAM-1 by flavivirus, West Nile**

2006 : \$94,000

2007 : \$84,000

2008 : \$84,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

This project investigates the intracellular signalling pathway responsible for the expression of genes which are critical to our immune response. We have demonstrated in a mouse model that high levels of expression of two of these genes in flavivirus encephalitis are associated with a survival advantage. We would expect this project to provide basic new information about the mechanisms of expression of these genes as well as information about the interaction of this family of viruses, flavivirus with the host.

DP0665032 Dr B Kuhlmeiy

Approved Project Title **ARROW - the route to better Photonic Crystal Fibres**

2006 : \$74,340

2007 : \$74,340

2008 : \$74,340

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr B Kuhlmeiy

Administering Institution The University of Sydney

Project Summary

The Frontier Technology based on Photonic crystal fibres (PCFs) will be a vital component of next generation photonic networks and devices. Australia is among the 5 leading nations in PCF research. However we are now at a pivotal stage in the development of PCFs: their production is close to maturity, and it is now up to PCF designers to make the difference. The proposed project will provide the Australian scientific community as well as Australian photonics companies with advanced PCF designing capabilities, giving Australia an opportunity to take a leading position in PCF development and commercialisation.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665446 Dr AH Kwan

Approved Project Title Zinc finger domains as scaffolds for protein engineering

2006 : \$110,000

2007 : \$89,000

2008 : \$89,000

Primary RFCD 3203 MEDICAL BIOCHEMISTRY AND CLINICAL CHEMISTRY

APD Dr AH Kwan

Administering Institution The University of Sydney

Project Summary

While great advances have been made in pharmaceutical design and discovery, it is clear that new types of drugs are needed for the better management of a wide range of diseases (e.g. cancers, autoimmune diseases, viral infections). Many of these diseases arise from inappropriate interactions between intracellular biological macromolecules. My aim is to develop a range of novel therapeutic proteins based on naturally existing zinc-binding protein domains with the goal of selectively blocking these inappropriate interactions. Additionally, these engineered proteins have potential uses as biochemical tools such as to help delineate the functions of natural proteins with no known functions.

DP0662876 Prof RD Lansbury; Dr J Kitay; Dr NR Wailes; Prof HC Katz

Approved Project Title Globalisation, Varieties of Capitalism and Employment Relations: A Study of the Automobile Assembly and Retail Banking Industries in Seven Countries

2006 : \$60,000

2007 : \$40,000

2008 : \$50,000

Primary RFCD 3502 BUSINESS AND MANAGEMENT

Administering Institution The University of Sydney

Project Summary

There are three national benefits associated with this project which examines the impact of globalisation on ER in two industries, across seven countries. Provides better understanding of an issue which has consequences for the competitiveness of Australian enterprises and the well-being of its employees. Enhances our understanding of issues central to economic performance of many of our major trading partners. gives insight into the social and political consequences of globalisation which impact both the stability of our region and international agreements between countries.

DP0664706 Prof PA Lay; Dr HH Harris; Dr AP Stampfl

Approved Project Title Nanoprobe and Microprobe Structural and Spectroscopic Studies in Biomedical Research

2006 : \$125,000

2007 : \$114,000

2008 : \$103,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Institution 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 multi-layered information on 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 lower side effects.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666574 Dr MI Letnic

Approved Project Title **Do dingoes regulate the structure of arid ecosystems?**

2006 : \$110,000
2007 : \$110,000
2008 : \$100,000

Primary RFCD 3008 ENVIRONMENTAL SCIENCES
APD Dr MI Letnic

Administering Institution The University of Sydney

Project Summary

Predation by the red fox and land degradation due to overgrazing have been identified as major factors contributing to the loss of biodiversity in arid Australia. I hypothesise that dingoes by regulating populations of foxes and herbivores may have positive effects on biodiversity. If this hypothesis is supported, this project will have great significance for biodiversity conservation and is likely to irrevocably change land and wildlife management practices in Australia. The recommendations arising from this research will influence policy on land management and contribute to achieving an environmentally sustainable Australia.

DP0666446 Dr W Li; Prof MV Swain

Approved Project Title **Effects of prosthesis design on bone remodelling and longevity of dental restorations**

2006 : \$130,000
2007 : \$110,000
2008 : \$110,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING
APD Dr W Li

Administering Institution The University of Sydney

Project Summary

The project targets both the 'Promoting and Maintaining Good Health' and 'Advanced Materials' designated research priority areas. The research will underpin Australia's leading role on some emerging interdisciplinary frontiers of biomechanics, biomaterials, health sciences and biomedical software. The development of computer aided clinical plan will help optimise dental restorations for 'long-term success'. The benefit will be to improve the ongoing performance and longevity of dental restoration, which complies with the highly demanding national goal of 'ageing well'. The study will also provide a new means to improve the therapy effect for many young Australians' effort towards a 'healthy start to their life'.

DP0665488 Prof LF Lindoy; A/Prof GV Meehan

Approved Project Title **Metal Directed Assembly of New Supramolecular Systems**

2006 : \$100,000
2007 : \$95,000
2008 : \$95,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Institution 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.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666465 Dr CD Ling

Approved Project Title **Platinum-group Metal Oxides with Modulated Crystal Structures: Flexible Frameworks Designed for Geometrically Frustrated Magnetism**

2006 : \$80,000

2007 : \$45,000

2008 : \$50,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Institution The University of Sydney

Project Summary

Magnetic materials are of huge importance to modern society because of the key roles they play in devices such as hard disks, sensors, switches and permanent magnets. This project will focus on the chemical design and synthesis of novel, flexible and unconventional magnetic materials. Their study will lead to improved theories of magnetism and superconductivity, and ultimately to technologies such as new data-storage media. The project will also help introduce Australian scientists to their new research reactor and synchrotron, which will play critical roles by allowing exceptionally thorough and systematic studies to be carried out.

DP0667170 A/Prof CA Lumby; Prof EC Probyn; Dr JA O'Dea; Ms KM Albury

Approved Project Title **The Well-Rounded Person: The Role of Sport in Shaping Physical, Emotional and Social Development.**

2006 : \$88,396

2007 : \$105,000

2008 : \$120,000

2009 : \$105,578

2010 : \$41,714

Primary RFCD 4203 CULTURAL STUDIES

Administering Institution The University of Sydney

Project Summary

Young Australians who play sport have better physical health, higher levels of self-esteem and are less likely to be obese. Yet sports participation rates among young Australians remain low and there are growing concerns that participation in some sports is associated with antisocial off-field behaviours. This project investigates the real impact playing sport has on young Australians' physical, emotional and social development. It will identify barriers to participation in sport and suggest solutions to concerns about antisocial behaviours. Ultimately, this project will assist public and private sector organisations involved with sport to increase participation and tackle negative attitudes or behaviours associated with that participation.

DP0666656 Dr KJ Lyytikäinen

Approved Project Title **Complex Dopant Diffusivity in Photonic Crystal Fibres and Applications**

2006 : \$110,000

2007 : \$125,000

2008 : \$120,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

APD Dr KJ Lyytikäinen

Administering Institution The University of Sydney

Project Summary

The outcomes of this research in the area of doped photonic crystal fibres will enable Australia to commercialise the technology and provide an opportunity for leading commercial ventures using novel doped PCF. These opportunities will eventually become large-scale industrial activities developed from the research in fields such as sensing, biophotonics, medical and defence and will result in significant economic benefit for Australia. Fundamental research outcomes in glass and dopants that can boost devices and introduce novel devices resulting from this project will contribute to all National Research Priorities.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666261 Dr J Ma

Approved Project Title **The development of super-toughened epoxies using a novel nanomaterial**

2006 : \$95,000

2007 : \$95,000

2008 : \$95,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

APD Dr J Ma

Administering Institution The University of Sydney

Project Summary

Epoxy resins are widely used as structural adhesives and coatings in engineering structures. This project will address the problem of the intrinsic brittleness of epoxy by making it significantly tougher with superior performance and cost-effectiveness. Our technology for producing super-toughened epoxy will lead to a wide range of applications for new and existing products in the construction, automotive, aerospace, adhesive and microelectronics industries.

DP0664941 Dr JP Mackay; Prof M Crossley

Approved Project Title **Structure and function of a new class of multi-zinc finger (MZF) transcriptional regulators**

2006 : \$200,000

2007 : \$165,000

2008 : \$165,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Sydney

Project Summary

An understanding of how genes are switched on and off during the development and lifetime of an organism is central to developing the ability to fight many diseases in a rational way. This project will advance our knowledge in this area at a fundamental molecular level by examining the mechanisms through which a specific set of proteins controls gene expression.

DP0667271 Dr RS Magnusson

Approved Project Title **Lifestyle wars: law's role in responding to the challenges of non-communicable diseases**

2006 : \$47,000

2007 : \$55,000

2008 : \$54,000

Primary RFCD 3901 LAW

Administering Institution The University of Sydney

Project Summary

In economic, social and personal terms, non-communicable diseases impose a massive health burden upon Australian society. Law is a potent tool that could influence the economic, environmental and social structures, as well as the personal choices, that generate poor health outcomes. Very little work has been carried out on law's relationship with non-communicable diseases, either in Australia or internationally. By exploring and promoting the contribution that public health law can make to health policy on non-communicable diseases, this project will contribute to the promotion and maintenance of good health in Australia.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666584 Prof M Maher

Approved Project Title **Curious Places: Agent-Mediated Self-Aware Worlds**

2006 : \$105,000

2007 : \$75,000

2008 : \$75,000

Primary RFCD 3102 BUILDING

Administering Institution The University of Sydney

Project Summary

This project develops and demonstrates a model of curious places: physical and digital environments that adapt their behaviour based on their experiences. This means that we can implement new kinds of places, rooms, public spaces, that respond to human activity and new technology by creating their own goals and behaviours. This is a benefit to Australia by expanding its capability in home automation and leading developments in novel human-computer interfaces. This benefit can provide economic gain to Australia through the development of frontier technologies.

DP0663123 Dr N Mai-Duy

Approved Project Title **Meshless, numerical modelling for polymer processing**

2006 : \$80,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2914 MATERIALS ENGINEERING

APD Dr N Mai-Duy

Administering Institution The University of Sydney

Project Summary

The new modelling technology will significantly improve Australian polymer producers' competitiveness and their ability to respond to international market forces. The technology will lead to new opportunities for Australian companies that develop simulation software. Our consumers will benefit from improvements in the design of polymer products. Our researchers in rheology and computational mechanics will gain further opportunities to extend the advances this project will make.

DP0665849 Prof I Marsh

Approved Project Title **Neo-liberalism and the Decline of Democratic Governance: A Problem of Institutional Design?**

2006 : \$76,000

2007 : \$70,000

2008 : \$70,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Institution The University of Sydney

Project Summary

How well Australia's democracy is working is critical both for national policy making and for citizenship. Many scholars argue that populism is in the ascendant, political parties have weakened and that public confidence in political leaders has diminished. This project will provide an authoritative test of these propositions. If they are established, it will identify the ways democratic governance can be renewed.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664915 Prof Dr T Maschmeyer; A/Prof AF Masters

Approved Project Title **Molecular Recognition in Chiral Ionic Liquids as Basis for the Design and Synthesis of New Enantioselective Heterogeneous Catalysts and Membranes**

2006 : \$160,000

2007 : \$105,000

2008 : \$115,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Institution The University of Sydney

Project Summary

Molecules that can exist as mirror images, each with different, e.g., beneficial vs. toxic properties, underpin the pharmaceutical industry and increasingly new highly selective pesticides, and flavours/fragrances.

Current commercial pathways often make mixtures of the mirror images that then need to be separated laboriously. These routes are inefficient, creating waste and use resources poorly.

We aim to create solutions for these problems, using supported thin films of special, new types of salts that are liquid at room temperature, and which have other unusual chemical properties that make them ideally suited to enable efficient conversions.

DP0665944 Dr A Mathas; Dr RB Howlett; Dr DI Cartwright; Prof J Shi

Approved Project Title **Affine buildings and Hecke algebras**

2006 : \$101,000

2007 : \$91,000

2008 : \$93,000

Primary RFCD 2301 MATHEMATICS

Administering Institution The University of Sydney

Project Summary

This project is breakthrough science. Affine buildings, Ramanujan complexes and the representation theory of affine Hecke algebras are on the cutting edge of research in mathematics, as evidenced by recent special programs at Cambridge and Princeton. The outcomes from this project will be published in first class journals and they will be implemented in computer algebra systems for world wide application. The project is likely to have flow-on effects in other disciplines, notably communication networks, mathematical physics and computer science.

DP0663289 Dr JM Matthews

Approved Project Title **LIM-homeodomain interactions in neuronal development**

2006 : \$120,000

2007 : \$106,000

2008 : \$106,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

The loss of central nervous system function, through accident or disease, is devastating for affected individuals and their families. Our current inability to stimulate the regeneration of nervous tissue is a result of the lack of detailed knowledge of the complex processes that must take place, at the molecular and cellular levels, during neuronal development. We are determining how a group of cellular proteins that have key roles in motor neuron development interact with each other and with DNA. With this information we are developing reagents that can be used to further probe central nervous system function and may ultimately be used to regenerate damaged nerves.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666847 Prof JW McAvoy; A/Prof RJ Truscott; Dr JA Aquilina

Approved Project Title **Understanding lens aging: the molecular basis of presbyopia**

2006 : \$140,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 3210 CLINICAL SCIENCES

Administering Institution The University of Sydney

Project Summary

Ageing has major consequences in the deterioration of vision, notably, the inability to focus on near objects. The understanding gained through this study of age-related lens changes may allow us to prescribe drugs or diets that alter lens properties and thus delay the need for glasses. This would have great benefits not just in decreased inconvenience of users, but also in cost to the middle-aged and elderly. In addition, data will be used to underpin the development of a flexible intraocular lens (IOL). Hard IOLs are routinely inserted into human eyes following cataract surgery. In the future, flexible IOLs based on the properties of young lenses will be used, rather than reading glasses. This new industry could be based in Australia.

DP0667221 Dr IS McGregor

Approved Project Title **Learning about threats: the neural and behavioural response to predator-related cues in rodents**

2006 : \$50,000

2007 : \$45,000

2008 : \$52,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Sydney

Project Summary

This project will investigate the anxiety displayed by rats when confronted with the odours of predators such as cats. This anxiety may be very similar to that experienced by humans who suffer from anxiety disorders such as phobias. By investigating the nature of this anxiety, the nature of the stimuli that produce it, and the learning and neural processes that underlie it we may better understand human anxiety. The project also aims to identify novel chemicals in the fur of cats that have rodent repellent properties. Such chemicals may be of great use in domestic and agricultural contexts where rodents are pests.

DP0666866 Prof DR McKenzie; A/Prof DG McCulloch

Approved Project Title **Novel Carbon Coatings for Exceptional Performance**

2006 : \$150,000

2007 : \$100,000

2008 : \$100,000

Primary RFCD 2914 MATERIALS ENGINEERING

Administering Institution The University of Sydney

Project Summary

Carbon coatings are technologically important and have many applications in automotive and biomedical industries worldwide. An example automotive application is as a coating for high performance fuel injectors. Carbon coatings have significant unrealised potential for applications in hostile environments such as those encountered in high performance engineering components and in the human body. This project will develop new types of carbon coatings with properties and performance tailored to applications in biomedical engineering, energy conversion, automotive engineering, manufacturing and microelectronics. The result will be a range of new carbon coatings with exceptional properties and cost-effective synthesis methods.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663006 Dr MD McLeod; Dr M Collins (Chebib)

Approved Project Title **Elucidating the Mode of Action of Nicotinic Receptor Ligands**

2006 : \$95,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution The University of Sydney

Project Summary

Changes in brain function can cause human diseases such as epilepsy, schizophrenia and Alzheimer's disease. To develop new medicines to treat these conditions we need to study how drugs act in the brain. This project will use new methods of chemistry to make drugs, which will then be tested for biological activity at important brain receptors. This will tell us which compounds are most effective as potential drugs and also exactly where they act in the brain.

DP0665923 Prof RC McPhedran

Approved Project Title **Optical Nano-plasmonics**

2006 : \$153,000

2007 : \$160,000

2008 : \$160,000

2009 : \$160,000

2010 : \$160,000

Primary RFCD 2404 OPTICAL PHYSICS

APF Prof RC McPhedran

Administering Institution The University of Sydney

Project Summary

There is much current interest and excitement in nano-optics, where light interacts with features on its own scale or finer than it. One way of achieving strong interactions between light and finely structured systems is to incorporate metallic elements, and use the resonances called surface plasmons which arise due to electric currents flowing on the metal. We will develop accurate ways of calculating the properties of these plasmons for a range of metal-dielectric systems, in order to design highly miniaturized structures which can manipulate light for applications in optical sensors and related devices.

DP0666239 A/Prof SR Meikle; A/Prof DL Bailey; Prof RB Banati

Approved Project Title **New Imaging Instrumentation and Algorithms for the Simultaneous Measurement of Multiple Radio-labelled Probes in vivo**

2006 : \$172,889

2007 : \$169,926

2008 : \$183,938

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Institution The University of Sydney

Project Summary

Medical imaging plays an increasingly important role in basic biological research and health care. This project will lead to new imaging technologies that allow the simultaneous measurement of more than one biological process at a time in living subjects, providing new insights into disabling diseases, such as cancer and mental illness. An immediate benefit will be to strengthen the expertise in biomedical engineering and instrumentation development in Australia, where we have international leadership. The technologies developed will provide advanced tools for making fundamental biological discoveries and translating them into biotechnological or clinical applications.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665717 Dr M Melatos

Approved Project Title **An Economic Analysis of Migration Patterns in a Regionally Integrated World**

2006 : \$26,000

2007 : \$20,000

2008 : \$25,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Institution The University of Sydney

Project Summary

Australia, among other countries, is pursuing a discriminatory free trade (i.e. RTA) agenda. The slow progress of WTO multilateral talks will exacerbate this trend. At the same time, the level of migration to developed countries, like Australia, has been growing. What are the implications of RTAs for immigration policy in Australia? How will RTAs, whether they include or exclude Australia, influence migration flows to and from this country? Among other things, this project helps clarify the relationship between Australia's discriminatory trade liberalisation strategy and migration patterns. The underlying theme of this research is that trade policy should be designed so that it is consistent with the aims of migration policy.

DP0665318 Ms RM Millar

Approved Project Title **GST and the global economy: identifying the underlying causes of consumption tax conflicts affecting cross-border trade**

2006 : \$55,000

2007 : \$40,000

2008 : \$45,000

Primary RFCD 3501 ACCOUNTING, AUDITING AND ACCOUNTABILITY

Administering Institution The University of Sydney

Project Summary

This project will provide an independent analysis of the desirability of particular types of destination based jurisdictional rule in a GST/VAT in light of their effects on global trade and revenue collection. Focussing on basic principles, the project will assess the relationship between the ideal subject of the tax (consumption) and the practical effects of existing laws (which tax their own peculiar concept of consumption). The inclusion of comparative research on developing and transition countries will enable Australia to assess the outcomes of the concurrent OECD and EC work in this area from a broader perspective and to evaluate the effects of its own laws on both global trade and the revenue of Australia and its trading partners.

DP0663767 A/Prof J Millbank; Dr CD Dauvergne

Approved Project Title **An International Comparative Analysis of Refugee Decision-Making**

2006 : \$100,000

2007 : \$80,000

2008 : \$100,000

Primary RFCD 3903 JUSTICE AND LEGAL STUDIES

Administering Institution The University of Sydney

Project Summary

Surprisingly little information is available about the actual practice of refugee decision-making and the results of different kinds of claims (which are only recorded by the country of the claimant, not the basis of the claim). This project focuses upon practice "on the ground" to look at what is really happening. Currently, almost nothing is known about asylum seekers by category of claim (ie race, religion). This research will examine in detail many hundreds of cases made over a 10 year period. This data will contribute to a consistent and just decision-making process nationally and internationally. This in turn will ultimately reduce the burgeoning trend of costly and lengthy litigation.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0667131 Prof RA Minasian

Approved Project Title **Novel coherence-free photonic microwave signal processors**

2006 : \$160,000

2007 : \$160,000

2008 : \$155,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Institution The University of Sydney

Project Summary

With the increasing bandwidth requirements of information signals, there is an unprecedented challenge to provide high-speed and high resolution systems for signal processing. The new photonic signal processors in this project will herald in a new epoch in the ability to optimally condition wideband signals, with important applications for science, business and security services. These processors will have particular impact in transcending existing electronic processor limitations and in enhancing fibre-fed distributed antenna systems, with benefits to Australia in the fields of radioastronomy and radar systems in defence.

DP0664650 Prof BJ Morris

Approved Project Title **Function of a new splicing factor, RBM4**

2006 : \$104,000

2007 : \$94,000

2008 : \$94,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

New genomic knowledge is revolutionizing our world. However our understanding of the basic mechanisms of RNA maturation, especially regulation of splicing lags significantly behind our understanding of related genomic processes. This project is a genetic approach to help elucidate the function of new splicing factors and characterize the way in which specific RNA sequences are recognized. It should promote the better understanding of regulatory events involved in controlling gene expression during development and differentiation. Results from this project will also provide new insights into the 'multifunctionality' of cellular proteins and will illustrate the importance of RNA studies in molecular medicine.

DP0663987 Dr C Mountford

Approved Project Title **Development of Novel Two-dimensional Techniques for Magnetic Resonance In-vivo Spectroscopy**

2006 : \$160,000

2007 : \$120,000

2008 : \$140,000

Primary RFCD 2499 OTHER PHYSICAL SCIENCES

Administering Institution The University of Sydney

Project Summary

Body chemistry alters with functionality, pain, ageing and disease. These changes can be recorded by magnetic resonance (MR) spectroscopy (MRS) in vivo in a whole body MR scanner. When changes in chemistry can be recorded rapidly, and the individual species assigned, it will be possible to make a definitive diagnosis and in some cases allow the tailoring of treatment on an individual basis. This is currently hampered by our inability to separate the composite resonances in a one dimensional MR spectrum. Research will allow two dimensional MRS to be implemented and provide detailed chemical information on human organs in vivo.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666236 Dr BK Nauta

Approved Project Title Helium droplets: a nanoscale laboratory for studying intermolecular bonding and chemical reactivity.

2006 : \$130,000

2007 : \$130,000

2008 : \$130,000

2009 : \$103,000

2010 : \$103,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

ARF Dr BK Nauta

Administering Institution The University of Sydney

Project Summary

This type of research requires a rather complicated apparatus capable of creating a stream of helium droplets, embedding molecules and interrogating their properties using laser spectroscopy. The apparatus built in Sydney is the only one capable of this in Australia and using this new apparatus we will create many novel, bizarre and intriguing aggregates of molecules and atoms. The project involves cutting-edge scientific methods and will shift the boundaries of can-do science in the laser laboratory at the University of Sydney and in Australia in general.

DP0664629 A/Prof BP Oldroyd

Approved Project Title Solving Darwin's dilemma: Molecular analysis of worker sterility in social insects

2006 : \$182,000

2007 : \$147,000

2008 : \$147,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Sydney

Project Summary

One of Darwin's greatest puzzles was how natural selection resulted in worker sterility in social insects. We now know from mathematical modelling that a gene that causes sterility in workers can be at a selective advantage if it increases the reproductive success of queens. This project will take the only known gene that causes sterility, 'Anarchy' from honey bees, and determine how this gene evolved. We will determine if Anarchy is the same gene that causes sterility in all social insects, or only in honey bees. The project will be at the forefront of international research by providing a molecular perspective to Darwin's greatest dilemma.

DP0666284 Prof M Onslow; A/Prof RG Menzies; Dr MA Lincoln

Approved Project Title Establishing the relationship between anxiety and stuttering

2006 : \$80,000

2007 : \$60,000

2008 : \$70,000

Primary RFCD 3210 CLINICAL SCIENCES

Administering Institution The University of Sydney

Project Summary

The present project will establish basic knowledge about the disorder of stuttering, which will contribute to offsetting the personal and community costs of the disorder by guiding empirical investigations into its nature and the development of future treatments. Further benefits at the population level will occur by provision to the public of basic information about the disorder assembled from this project. By conveying information from the present project to clinicians who treat stuttering patients, the project will benefit Australians who stutter.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665676 Prof PN Parkinson; A/Prof JA Cashmore; Hon Prof RC Chisholm

Approved Project Title Relocation after parental separation and the best interests of children

2006 : \$130,000

2007 : \$100,000

2008 : \$100,000

Primary RFCD 3901 LAW

Administering Institution The University of Sydney

Project Summary

The project is of importance not only for Australia, but internationally, because relocation disputes are a pressing issue around the world in family law. These disputes have become numerous as laws have changed in recent years to reflect the ideal that parents should share responsibility after separation and that children should have regular contact with both of them. This ideal clashes with the promise of divorce that individuals should be able to live their own lives without being unduly bound by ties to the other parent. This will be the world's first such prospective longitudinal study of the outcomes of relocation decisions. The national benefits will include better information for courts in making relocation decisions.

DP0667036 Prof R Pitchford

Approved Project Title Strategic Contracting with Complementary Assets under Assymmetric Information

2006 : \$40,000

2007 : \$36,000

2008 : \$39,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Institution The University of Sydney

Project Summary

With the recent tendency for companies to patent any feasible innovations they might make, public policy must focus on the disincentive effects this may have for producers who must combine multiple patents. The project seeks to understand the 'holdout problem' that stems from such situations, and evaluate policy solutions for Australia and Internationally. Expected outcomes include publication in leading Australian and International journals, and inputs to the policy debate.

DP0665164 Dr WN Pritchard; Prof J Connell

Approved Project Title Indian agriculture in the 21st century: The political economy of market reforms

2006 : \$20,000

2007 : \$30,000

2008 : \$55,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Institution The University of Sydney

Project Summary

India has emerged to be a key player in the 21st century global economy, with the fortunes of its agricultural sector central to its economic and social transformations. These issues have great relevance beyond India itself, and are of vital interest to Australia. India's prominent role in WTO agricultural negotiations means that its stance on market agriculture will shape the future global politics of food. Using case studies of strategic sites of market reforms, this project will analyse their social and economic outcomes, with the aim to generate an internationally significant assessment of the political economy of Indian agrarian reform.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665064 Prof P Reimann; A/Prof BR Paltridge; Dr RA Calvo

Approved Project Title **Using machine learning and automated document analysis methods to support English composition training**

2006 : \$90,000

2007 : \$55,000

2008 : \$55,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Institution The University of Sydney

Project Summary

The project has the potential to further strengthen Australia's Higher Education industry by providing scalable solutions for teaching academic writing, a core competence for students in the tertiary sector. It is also a contribution to the E-learning industry in general. Innovating with these respective technologies will have a significant impact on the quality of online training. Australian organizations will be able to reap the benefits of a well-tested platform, with the exclusive added capabilities that this project will develop. One of the software systems to be used in this project is an open source Learning Management System that is available to every Australian institution without any licensing cost.

DP0666378 Dr JR Reimers

Approved Project Title **Molecular Electronics Principles and Applications**

2006 : \$231,000

2007 : \$240,000

2008 : \$250,000

2009 : \$256,000

2010 : \$254,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

APF Dr JR Reimers

Administering Institution The University of Sydney

Project Summary

This project will establish basic conceptual models and computational methods to understand the nature of conduction, memory storage, and solar to electrical energy conversion processes in molecular devices on the 1-nanometer scale. Fundamental research of chemical processes, device interfaces, characterization techniques, and natural photosynthesis will result in widely applicable advances in nanotechnology. Additionally, novel architectures will be developed for disruptive new technologies in molecular memory and logic design, as well as in the design of biomimetic solar cells. These developments could lead to new Australian electronics industries and an order of magnitude reduction in the production cost of solar electricity.

DP0665963 Dr A Salih; Dr MV Matz; Dr J Wiedenmann; Prof R Hoffman

Approved Project Title **Development of novel fluorescent proteins from marine organisms for in vivo fluorescence imaging technologies and cancer research.**

2006 : \$75,000

2007 : \$65,000

2008 : \$65,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Sydney

Project Summary

The Australian Great Barrier Reef (GBR) is a national treasure and the development of fluorescent proteins (FPs) from reef organisms for in vivo imaging and biotechnology will enhance the appreciation of this resource. Nowadays, imaging of biochemical processes in living cells is essential for knowing the roles of various genes and proteins in health and diseases. The global market for fluorescence-based products is estimated in billions of dollars p.a. The discovery of natural FPs from GBR with superior molecular, biophysical and optical characteristics to those of commercially available FPs offers a unique opportunity to develop advanced tools to study cellular processes and develop diagnostic assays for diseases such as cancer.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665824 Dr T Schmidt

Approved Project Title **Laser Spectroscopy of Molecular Electronic Components**

2006 : \$150,000

2007 : \$95,000

2008 : \$100,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Institution The University of Sydney

Project Summary

Electronic devices such as computer memory have been getting smaller and smaller for decades, yet soon devices will need to be constructed from single molecules. Single molecules behave very differently to copper conductors and silicon chips. To understand the behaviour of molecular electronic devices such as molecular wires, switches and diodes, one needs to isolate them under rigorously reproducible conditions. We will study molecular electronic devices in this way, providing rigorous support to Australia's growing expertise in this field.

DP0665831 Dr T Schmidt; A/Prof SH Kable; Dr BK Nauta

Approved Project Title **Optical Spectroscopy of Extraterrestrial Molecules**

2006 : \$134,000

2007 : \$91,000

2008 : \$98,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Institution The University of Sydney

Project Summary

Space is not empty. In the vast regions between stars is a complex soup of molecules. Some of these molecules get incorporated into meteorites and find their way to Earth where they can be identified. Analysis has yielded amino acids; the building blocks of life, but these molecules do not match what we know about the interstellar regions. Interstellar molecules are identified by their spectra, but many features in these spectra are unknown. Could they be caused by the missing molecules? In this project we combine the skills of three spectroscopists, each expert in different areas, in an attempt to make these molecules in the laboratory, measure their spectra and thereby identify these unknown molecules that are in space.

DP0666004 Dr HT See; Dr N Mai-Duy; Dr P Bacchin

Approved Project Title **Development of constitutive models for concentrated suspensions via particle-level simulations**

2006 : \$95,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Institution The University of Sydney

Project Summary

The outcome of this work will be a comprehensive theoretical framework by which accurate microstructural information is distilled into a macro-scale constitutive model of particulate suspensions, readily useable for modelling of practical industrial applications. This work will have a direct impact on the design capability and performance of a wide range of mechanisms and industrial processes involving suspensions. The development of better models for industrially useful suspensions offers a competitive advantage for a diverse range of Australia industry, from the food preparation sector, to mineral slurry transport, and water filtration and recycling.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664782 Dr S Selvadurai; Dr U Roehm; Dr BF Scholz; Dr A Viglas

Approved Project Title **Distributed Data Processing for Wireless Sensor Networks**

2006 : \$100,000

2007 : \$25,000

2008 : \$25,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Institution The University of Sydney

Project Summary

This project falls within the national research priorities of Frontier Technologies for building and transforming Australian Industries, and will provide Australian companies with state-of-the-art technology in wireless sensor networks (WSN). Australia's priorities are mainly in sustainable environment, health maintenance, and home-land security. Any application in these priority areas that uses our system will have less maintenance costs and a significantly longer lifetime. This project will generate numerous articles in first-class journals and conferences and will contribute to the strength of Australian Research in sensor technologies and ICT.

DP0662857 Dr LE Semler

Approved Project Title **Women's Poetry and Classicism in Early Modern England, 1500-1700**

2006 : \$55,059

2007 : \$20,000

2008 : \$31,620

Primary RFCD 4202 LITERATURE STUDIES

Administering Institution The University of Sydney

Project Summary

The primary national/community benefit of the project is the charting of how women pursued sophisticated education and imaginative literary expression despite the gender-biased structures of exclusion prevalent in early modern England. The period from Isabella Whitney's first published book (1567) to Margaret Cavendish's (1653) sees nothing less than the first emergence of Englishwomen as publishing authors. It is of great importance that this historical emergence be interrogated because it will help us understand how women rose from domestic silence to public voice, how they turned masculine classical resources to 'feminist' ends, and how the idea of the woman writer developed in England in the age of print.

DP0664709 Prof SJ Simpson; Dr M Beekman

Approved Project Title **On the move: the study of self-organised movement of animal groups with and without leadership**

2006 : \$190,000

2007 : \$155,000

2008 : \$155,000

Primary RFCD 2705 ZOOLOGY

Administering Institution The University of Sydney

Project Summary

This project will uncover the common principles that control the movement of large groups of organisms. We will focus on swarming honey bees, hopping bands of billions of locusts and millions of crickets marching in unison. The outcomes of our research will be broadly applicable to other collective phenomena, even to traffic and crowd control in humans.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665439 Dr S Sukkarieh

Approved Project Title **Data Fusion for Self-Localisation and Team Situational Awareness in Unknown Structured Environments**

2006 : \$120,000

2007 : \$25,000

2008 : \$25,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Institution The University of Sydney

Project Summary

This research is directed towards improving the operational effectiveness of our defence and civilian first-response-groups, which include the Special Forces, law-enforcement, fire fighting and special emergency services. These groups are highly specialised and have very focused operations which require innovative responses and adaptability. The technologies developed in the course of this project will transform the way these agencies conduct their operations and will have a beneficial impact on our quality of life and social order.

The research will also advance the knowledge base in the practical implementation of human localisation systems and provide the enabling mechanism for its adoption into industry.

DP0666307 Prof RI Tanner; Dr A Jabbarzadeh

Approved Project Title **Nano-Rheology and Nano-Tribology: Atomistic Simulation of Boundary Lubrication**

2006 : \$140,000

2007 : \$110,000

2008 : \$110,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Institution The University of Sydney

Project Summary

Manufacturing in atomic level is going to transform the efficiency level in many important applications. As molecular biology transformed medical and biological sciences, so molecular level material design and the techniques involved are going to significantly affect the engineering applications and manufacturing in coming decades. We have no doubt the benefits will flow from the project to many disciplines that are critical in manufacturing and commercialisation of nano-devices. The results will position Australia in the forefront of one of the most important leading edge technologies in the world. This not only will improve Australia's research profile in the world but also will enable it to capitalize on any future commercial outcomes

DP0665229 Dr RS Thompson; Dr TL Poepping; Dr WB Fraser; A/Prof C Macaskill

Approved Project Title **Material boundaries in ultrasonics: New methods and in vitro studies in biomedical phantoms**

2006 : \$95,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

Administering Institution The University of Sydney

Project Summary

Ultrasound is an indispensable part of healthcare worldwide. The next wave of applications will see ultrasound pulses used to closely probe suspected disease sites and to directly manipulate bioactive agents. For safe and effective use of such techniques it is essential to know the ultrasound field at the disease site. This project will develop simulation methods to achieve the fast, accurate and case-specific results required. Community healthcare will benefit, through better diagnostic capabilities and customized treatment. Australia is well placed to profit further from this research, in view of the growing worldwide demand for more sophisticated, knowledge-based techniques in medicine.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666325 Dr P Thordarson

Approved Project Title **Light-activated Bioconjugates for Applications in Synthesis and Biosensing**

2006 : \$240,000
2007 : \$120,000
2008 : \$120,000
2009 : \$120,000
2010 : \$150,000

Primary RFCD 2503 ORGANIC CHEMISTRY
ARF Dr P Thordarson

Administering Institution The University of Sydney

Project Summary

This project will allow the Australian biotechnology industry to develop better diagnostic biosensors that are controlled using light, making them cheaper and faster than the current generation of electronically controlled biosensors. Improvements in the response time of biosensors can be a matter of life and death, for instance, during a surgical operation. The project will benefit the pharmaceutical industry as it will allow the making of so-called chiral drugs cheaper and safer but problems with the purity of chiral drugs have in the past caused serious side-effects such as in the tragic case of thalidomide.

DP0665310 A/Prof RE Tiffen

Approved Project Title **Media Change. Political Change - Developments in Australian Newspapers' Political Reporting in the Age of Television**

2006 : \$108,000
2007 : \$80,000
2008 : \$96,000
2009 : \$78,000
2010 : \$40,000

Primary RFCD 4001 JOURNALISM, COMMUNICATION AND MEDIA

Administering Institution The University of Sydney

Project Summary

It is frequently asserted that the role of the press has changed since the advent of television, but there is a curious lack of data documenting the changes. This project will provide extensive, systematic and analytically-informed information about trends in newspapers' political coverage. Through an innovative combination of quantitative and qualitative research designs, it will chart the extent and timing of changes, and illuminate the external and internal forces driving them. The press remains central to the quality of Australian democracy and public discourse, and so there is a strong public interest in making debates about its changing performance more empirically grounded and analytically penetrating.

DP0666683 Prof L Tong; Dr P Tan

Approved Project Title **Shape adaptive structures with built-in compact smart material based actuators**

2006 : \$105,000
2007 : \$85,000
2008 : \$85,000

Primary RFCD 2902 AEROSPACE ENGINEERING

Administering Institution The University of Sydney

Project Summary

Primary Australian aerospace manufacturers are sub-contractors and constantly compete in the global market. Their products are primarily control surfaces, e.g., Boeing 757 and 777 rudders, 737 Krueger flaps. In light of the development of the hingeless control surfaces (HCS) in the smart aircraft wing program in the USA, the economic benefits of this project are very high because (a) it will address the key technological issue identified in the HCS program; and (b) it will enhance Australian manufacturers' technological standing and input in the design and manufacturing of next generation HCS by providing highly trained people with world-leading niche technology.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665818 Prof AJ Underwood

Approved Project Title **Connecting ecological processes controlling variation across spatial scales**

2006 : \$249,237

2007 : \$234,000

2008 : \$234,000

2009 : \$234,000

2010 : \$234,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APF Prof AJ Underwood

Administering Institution The University of Sydney

Project Summary

Large variability in numbers and types of animals from place to place and time to time characterizes many ecological systems, particularly on the rocky shores along our coasts. It confuses interpretation and hampers predictions about conservation, impacts and climatic change. This programme is a systematic experimental analysis of the major causes of variance (availability of suitable habitat and food, influences of weather) on the animals and indirectly on their food. The research will unravel the interacting influences that operate over several spatial scales to cause variability in local diversity. This will radically increase our capacity to sustain our coastal fauna.

DP0664742 Dr MA van Eijkelenborg; A/Prof GW Barton

Approved Project Title **Tailoring the functionality of microstructured polymer optical fibres**

2006 : \$160,000

2007 : \$120,000

2008 : \$120,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Institution The University of Sydney

Project Summary

Australia leads the world in microstructured polymer optical fibre (mPOF) research that has attracted serious commercial interest from multinational companies. A series of ATSE funded workshops in Europe during 2004 strongly indicated that the incorporation of a range of additional functionalities within novel fibres is the right path to follow to maintain research momentum and leadership. This interdisciplinary project offers a clear route to expanded collaboration in both Australia and overseas thus ensuring that the OFTC retains its research and technological edge into the future whilst helping to satisfy the demand for students trained in leading-edge photonics.

DP0664993 A/Prof RM van Krieken

Approved Project Title **Civilizing Divorce: Social Change, Law and the Transformation of Parenthood**

2006 : \$35,000

2007 : \$35,000

2008 : \$70,000

Primary RFCD 3901 LAW

Administering Institution The University of Sydney

Project Summary

The project will leave policy-makers, professionals, law reformers, and parents and their children themselves, better equipped to navigate their way through a major process of transformation in the way our intimate lives are structured. It will help take some of the 'heat' out of the child custody debate, to see current changes as an integral part of a broader process of change in our emotional relationships, and to broaden the conceptual resources available to policy-making and law reform concerning post-separation child custody.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666002 Dr SV Vladimirov

Approved Project Title **Complex plasmas: self-organized dusty matter from nanotechnology to astrophysics**

2006 : \$235,000
2007 : \$235,000
2008 : \$235,000
2009 : \$235,000
2010 : \$235,000

Primary RFCD 2403 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PHYSICS
APF Dr SV Vladimirov

Administering Institution The University of Sydney

Project Summary

The importance of complex plasmas is based on their intricate self-organized behaviour, on their rich variety in nature and extensive use in the laboratory and advanced technologies. This project aims at breakthrough results advancing the fundamental knowledge and contributing to frontier technologies such as nanoelectronics and nanotechnology as well as reliability of space technological systems and communications. The project will boost fundamental and applied aspects of the Australian science as well as international collaborative links of Australian research and technology by allowing access and involvement to advanced multi-national programs and high-profile experiments such as those on board the International Space Station.

DP0665856 Dr B Wang; Prof Y Mai

Approved Project Title **Some Outstanding Mechanics Problems in Layered Ferroelectromagnetic Composites with Enhanced Magnetoelectric Effect**

2006 : \$140,000
2007 : \$120,000
2008 : \$130,000
2009 : \$100,000

Primary RFCD 2914 MATERIALS ENGINEERING

Administering Institution The University of Sydney

Project Summary

The proposed research has high impact on both science and technology of ferroelectromagnetic materials. The outcomes will expand Australia's knowledge base and research capability in this emerging field. Relevant industries, such as smart materials and devices, can benefit from the results of this project. The theoretical, experimental and numerical results can be directly transformed to design and application guidelines for the materials engineers and scientists to develop innovative and structurally/functionally reliable ferroelectromagnetic composites and their various devices and products.

DP0666074 Mr RP White

Approved Project Title **A cultural history of Australian motor travel overseas**

2006 : \$74,000
2007 : \$81,000
2008 : \$88,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution The University of Sydney

Project Summary

This project will add to our understanding of Australians' changing perceptions of the world, the way that Australian identity has been performed when overseas and the practice of motor touring. It will be of direct benefit to the tourist industry and in contributing to our knowledge of Australia's relationship to the world and our region.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0667002 Prof S White

Approved Project Title **The Making of Black Manhattan**

2006 : \$137,000
2007 : \$143,000
2008 : \$121,000
2009 : \$133,000
2010 : \$135,000

Primary RFCD 4301 HISTORICAL STUDIES
APF Prof S White

Administering Institution The University of Sydney

Project Summary

This application stakes a claim for the importance of Australian scholarship in understanding the world's leading nation and our most important ally. It is vital that Australian perspectives shape the way we understand other cultures. This project will ensure that Australian scholars are at the cutting edge of the discipline, contributing to developments in the writing of history, demonstrating new and exciting ways of engaging with the past, rather than merely being passive consumers of American scholarship.

DP0666929 Dr L Zadro; Dr ML Moulds

Approved Project Title **Developing strategies to ameliorate the aversive effects of ostracism**

2006 : \$80,000
2007 : \$55,000
2008 : \$65,000

Primary RFCD 3212 PUBLIC HEALTH AND HEALTH SERVICES

Administering Institution The University of Sydney

Project Summary

By investigating and identifying strategies to ameliorate the aversive effects of ostracism, this research will permit exciting advances that will extend existing conceptual models in the ostracism literature. Further, given the prevalence of ostracism across societal, occupational and community domains, these studies will yield outcomes with significant and far-reaching practical implications. By applying rigorous experimental methodologies to answer theoretically driven questions about the impact of ostracism, these studies represent the interface of empirically sound and clinically and socially-oriented experimental research.

DP0665927 Dr R Zhang; Dr AI Molev

Approved Project Title **Infinite Dimensional Unitarizable Representations of Lie Superalgebras**

2006 : \$70,000
2007 : \$70,000
2008 : \$70,000

Primary RFCD 2301 MATHEMATICS

Administering Institution The University of Sydney

Project Summary

The project addresses major outstanding mathematical problems, which are of fundamental importance to the development of a unified theory of all four interactions in quantum physics. Mathematics is essential for the understanding of our own rationality. Advances in the field promised by this project are of intrinsic value. Physics is the foundation of modern technology. Success of the project will help to create a scientific environment in Australia that fosters technological creativity and innovation. Results of the project will greatly enhance the scientific reputation of Australia internationally, attracting foreign researchers and Ph.D students to Australian shores.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0667266 Prof AY Zomaya; Dr B Zhou; Dr M Charleston; Dr A Viglas

Approved Project Title **A Grid-Enabled Meta-Server for Protein Threading**

2006 : \$130,000

2007 : \$117,000

2008 : \$119,000

Primary RFCD 2804 COMPUTATION THEORY AND MATHEMATICS

Administering Institution The University of Sydney

Project Summary

Grid Computing is a driver for many e-Science research projects around the world today. The project investigates the use of grid technology in building a meta-server architecture for protein threading. Protein technology problems are important for the field of bioinformatics and they also influence many industries, such as, agriculture, drug design, food science, and many more. The proposed framework can be extended to other problems in the life sciences such as bio- and health-informatics. Projects of this nature are significant and will enable Australia to maintain its pioneering position and international reputation among other nations as leaders in Information Technology.