

Summary of Discovery Projects Applications for Funding to Commence in 2006

Queensland

The University of Queensland

DP0667070 Dr MA Adamska

Approved Project Title **Origin of multicellularity in animals: identification and analysis of intercellular signalling pathways in a basal metazoan, the demosponge Reniera**

2006 : \$75,000

2007 : \$65,000

2008 : \$65,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Queensland

Project Summary

The Reniera genome project is a multi-million dollar collaboration between JGI (US-DOE) and Australian scientists that will see the sequencing of the first Australian marine animal by 2006. This project will significantly advance our understanding of the origins of animals and contribute to the reconstruction of creatures that lived over 600 million years ago. A major outcome of this reconstruction will be a fundamental understanding of how cells communicate with each other during the process of development to give rise to the diversity of cell types within multicellular animals. This study will also shed light on what happens when cell communication goes astray, as observed in a range of human malignancies, including cancer.

DP0663809 Dr M Alauddin; Prof DP Rao; Prof TJ Coelli

Approved Project Title **The Sustainability of Agricultural Productivity Growth in a Changing Environment: An International Perspective**

2006 : \$80,000

2007 : \$60,000

2008 : \$68,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Institution The University of Queensland

Project Summary

The project could provide significant benefits to Australia. Australia is a dry continent with fragile natural resources, and a significant exporter of agricultural products. A sound knowledge of the factors that affect agricultural sustainability is crucial. Perhaps more importantly, identifying economic, environmental, social, institutional and political factors that influence agricultural sustainability in other countries, especially our Asian neighbours, will provide valuable information to relevant agencies in designing strategies aimed at ensuring that these countries are stable and well fed. This is of particular importance in the current climate, with growing influences of terrorist organisations in places where poverty exists.

DP0664045 Prof PC Almond

Approved Project Title **Protestant Apocalypticism, the Book of Revelation, and History in English Thought, 1550-1800**

2006 : \$51,070

2007 : \$31,070

2008 : \$50,000

Primary RFCD 4402 RELIGION AND RELIGIOUS TRADITIONS

Administering Institution The University of Queensland

Project Summary

This project will make a further significant contribution to Australia's strong international reputation in Early Modern Thought. It is crucial to Australians' understanding of our contemporary world in which Apocalyptic dualism, particularly the demonisation of the other by both Western conservative elites and Christian and Muslim fundamentalists, is a central feature of modern discourse. With conservative religious movements which treat the Bible literally significantly on the increase in Australia, it is crucial to the national interest to be aware of the socially divisive elements in both Biblical fundamentalism and contemporary Protestant sectarian Apocalypticism.

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DP0664320 Dr AJ Bellamy; Dr PD Williams

Approved Project Title **The Regionalisation of Peace Operations: Legitimacy, Effectiveness and Stable Peace**

2006 : \$90,000

2007 : \$45,000

2008 : \$60,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Institution The University of Queensland

Project Summary

Through its deployments in East Timor, the Solomon Islands, PNG and elsewhere, Australia has led the world in thinking about innovative ways of conducting peace operations. It is well-understood that peace operations in failed states can help to prevent terrorism by removing the conditions in which they prosper. To date, however, there has been no rigorous conceptually informed historical and contemporary research on precisely which types of actors are most effective. This project will add significantly to global understandings of peace operations and make an important contribution to Australian policy decisions about how best to maximise effectiveness.

DP0666891 Miss SM Bengtson Nash; Prof MR Moore; Prof Dr W Vetter; Prof MA Lang; Dr S Kawaguchi

Approved Project Title **Assessment of the Risks Posed to an Antarctic Keystone Species, Antarctic krill (*Euphausia superba*), Through Exposure to Persistent Organic Pollutants**

2006 : \$240,000

2007 : \$180,000

2008 : \$180,000

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

APD Miss SM Bengtson Nash

Administering Institution The University of Queensland

Project Summary

POPs are subject to a global treaty seeking to reduce and eventually eliminate these chemicals from the environment. Inhibiting the development of effective intervention strategies is a lack of knowledge regarding biological dose-response and cause-effect relationships. The proposed study will develop multiple endpoint assays to investigate these species-specific relationships and undertake a multidisciplinary risk assessment of increasing POP levels to *E. superba*. The research will fulfil national treaty requirements and represents an excellent opportunity to advance the field of polar and marine POP ecotoxicology. Outcomes will be critical for the sustainable management of a commercial resource and a pressured keystone species.

DP0666369 Dr AI Bishop

Approved Project Title **Development of a neutral helium beam microscope**

2006 : \$165,000

2007 : \$80,000

2008 : \$80,000

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

APD Dr AI Bishop

Administering Institution The University of Queensland

Project Summary

This project would demonstrate Australia's capability in developing leading edge technologies applicable to the growing nanotechnology industry. The development of a neutral helium beam microscope brings into Australia expertise in the emerging field of molecular optics, and would place Australia as one of the first countries to make a commitment to this field. The project will develop a prototype instrument which is aimed at becoming a commercially viable product - the neutral helium beam microscope. The possibilities of using the microscope system as a nanofabrication device would also give researchers in Australia the ability to fabricate structures that could not be manufactured anywhere else in the world.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663485 Prof RJ Capon; Dr R Lewis; Dr MD Norman

Approved Project Title **Novel Sodium Ion Channel Modulators From Australian Cephalopods.**

2006 : \$110,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution The University of Queensland

Project Summary

Many Australian cephalopods (octopuses, squids, cuttlefishes and nautilus) use potent toxins to rapidly paralyse diverse prey and defend against predators. These toxins act by the efficient blocking of ion channels critical to the transmission of nerve impulses. Knowledge of these toxins can lead to safer and better drugs for the relief of chronic pain.

DP0665821 Prof RG Carson; Asst Prof AG Cresswell

Approved Project Title **An inverse control approach to resolving the neural basis of spatial and muscular dependencies in coordinated multi-limb movements**

2006 : \$70,000

2007 : \$65,000

2008 : \$70,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

Each year 48,000 Australians suffer from stroke with many survivors left with problems that limit limb function. With reduced duration of hospital care, the opportunities for retraining in the period immediate following stroke are rapidly diminishing. Effective and efficient strategies of rehabilitation that will maximise the level of recovery following stroke will result in benefits expressed in terms of enhanced quality of life and functional life-span, as well as significantly reduced costs of health care. In understanding the fundamental principles underlying the stability and adaptability of movement coordination, this research is likely to make a significant contribution to the design of programs for movement rehabilitation.

DP0663144 Dr KL Cheney

Approved Project Title **The function and maintenance of aggressive mimics: the cleaner fish - fangblenny system**

2006 : \$140,000

2007 : \$118,000

2008 : \$118,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APD Dr KL Cheney

Administering Institution The University of Queensland

Project Summary

Mimicry is an important biological phenomenon, which is studied extensively by scientists. However, only 5% of papers that were published on mimicry systems in the last five years were from Australian institutes, yet mimicry is ubiquitous in Australia. Therefore, this study will enhance the recognition of Australian research on the international stage in mimicry studies, animal communication systems and behavioural ecology. This work will aid communication of biology to the general public, as mimicry is a celebrated example of Darwinian adaptation and stories about coral reefs are interesting and intuitive. This study will also provide empirical data to support theoretical development of mimicry theory.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664869 Dr SF Chenoweth

Approved Project Title **A Genomic Dissection of Natural Adaptation in Mate Recognition**

2006 : \$180,000
2007 : \$125,000
2008 : \$125,000
2009 : \$125,000
2010 : \$125,000

Primary RFCD 2702 GENETICS

ARF Dr SF Chenoweth

Administering Institution The University of Queensland

Project Summary

Adaptation is a fundamental area of evolutionary biology but we know surprisingly little about its underlying genetic basis. As a process, adaptation poses several challenges for Australian society including bacterial evolution of resistance to antibiotics, HIV resistance to antiviral medications and the evolution of pesticide resistance in agricultural pests. This study will use a model system and genomic tools to test theoretical models of the genetic basis of adaptation. This integrative approach will enhance Australia's research profile in genomics and evolutionary biology. The project will provide emerging scientists with skills in areas including genomics, molecular biology, evolutionary biology and agricultural genetics.

DP0664092 Dr BM Collins

Approved Project Title **The molecular mechanism of retromer and sorting nexin function in endosomal membrane trafficking**

2006 : \$71,000
2007 : \$71,000
2008 : \$71,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

The proposed research represents breakthrough science that will lead to a fundamental understanding at the molecular level of the structure and assembly of the retromer complex and how it regulates sorting of receptors in the endosomal system. It will provide excellent research training for top graduate students and post-doctoral scientists in multidisciplinary methods that constitute state-of-the-art structural and molecular cell biology research. By addressing an area of great interest internationally the project will have the capacity to increase Australia's knowledge base and strengthen its reputation for research excellence.

DP0666020 Prof M Colyvan; Dr DG Hyde

Approved Project Title **A Paraconsistent Approach to Vagueness**

2006 : \$77,801
2007 : \$80,446
2008 : \$75,641

Primary RFCD 4401 PHILOSOPHY

Administering Institution The University of Queensland

Project Summary

This project will utilise logical techniques that have been developed largely by Australian logicians. These techniques will be brought to bear on the problem of vagueness, one of the most important problems in the philosophy of logic. The project will thus greatly enhance Australia's already strong international reputation in logic and philosophical logic.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0662820 Dr HM Creese

Approved Project Title **Sketches of Bali in 1830: The unpublished letters and papers of Pierre Dubois, Dutch agent at Kuta, 1828-1831**

2006 : \$60,000

2007 : \$25,000

2008 : \$41,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution The University of Queensland

Project Summary

The primary benefit of this work is its scholarly contribution to knowledge of Indonesian history in the nineteenth century. Perceptions of Bali forged in the colonial period provide the foundation on which contemporary ideas of identity are constructed. These images, notably those pertaining to Bali's Hindu religion and unique culture, remain important to contemporary Indonesian regional identities. They also point to some of the complex interconnections across Western and Indonesian cultures. As Australia-Indonesia relationships enter a more optimistic phase, this historical research thus has the potential to broaden our understandings of cultural differences to enhance Australia's capacity to interpret regional issues.

DP0664103 A/Prof FB D'Agostino

Approved Project Title **Using empirical materials to inform normative thinking about the organization of groups for the production of knowledge**

2006 : \$48,776

2007 : \$20,000

2008 : \$48,776

Primary RFCD 4401 PHILOSOPHY

Administering Institution The University of Queensland

Project Summary

It is increasingly apparent that knowledge is produced by organized groups-e.g. research or management teams. The idea of heroic individual creators is still presented in popular media, but has little credence in hard-headed organizational contexts, where, e.g., Wenger's idea of the community of practice plays an important role in steering policy and institutional development. Finding out how we can organize collectives so that they can function WELL as producers of knowledge is the aim of this project in social epistemology. Its success will contribute directly to theoretical discourse about innovation in organizations and promises to contribute indirectly to the improvement of the institutional bases of our cultural and economic capital.

DP0662882 A/Prof RG Duggleby; Prof Z Li

Approved Project Title **Development of new herbicides targeting enzymes involved in the biosynthesis of branched-chain amino acids**

2006 : \$94,000

2007 : \$89,000

2008 : \$89,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

Modern agriculture is heavily reliant on the use of herbicides. An inevitable consequence of herbicide usage is that resistant weeds will develop. Therefore, there is a continuing need to develop new herbicides to kill these resistant species. Herbicides interact with vulnerable molecular targets in plants, such as photosynthesis or the biosynthesis of certain amino acids. This project will attempt to develop new herbicides that act upon two molecular targets that are not exploited by herbicides that are used currently. We will design, synthesize and test a variety of new compounds as potential environmentally-benign herbicides.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0662927 Prof RE Elson

Approved Project Title **The origins and trajectory of secularism in modern Indonesian politics**

2006 : \$47,000

2007 : \$44,000

2008 : \$36,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution The University of Queensland

Project Summary

This research will provide both historical perspective and contemporary analysis of the vexed problem of secularism in Indonesian politics. It will provide a more nuanced understanding of the complexities of the secularist bent in Indonesian political history and thinking, and will assist commentators, scholars and policy makers better to appreciate Indonesia's continuing struggle to create, construct and maintain a secularist polity.

DP0664486 Dr DS Ferber

Approved Project Title **Medicine and Culture: Bioethics in Historical Perspective, 1850 to the present**

2006 : \$62,000

2007 : \$20,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution The University of Queensland

Project Summary

Australia has long been looked to as an example for legislative and community responses to new medical technologies and as a leader in debates about medical ethics. The project will contribute to the international profile of Australia as a leader in health policy issues, as well as sustaining a focus on informed community debate.

DP0663718 Dr Z Ficek

Approved Project Title **Entanglement Processing in N-Atom Systems**

2006 : \$74,000

2007 : \$74,000

2008 : \$74,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Institution The University of Queensland

Project Summary

An essential part of modern technological society is an understanding the scientific explanation of the world around us, and a realization that these explanations must be critically tested in the light of technological advances. The study of multi-atom entanglement is closely related to questions of fundamental physics. A breakthrough in stimulating this problem could have applications in other areas of physics and in technology, such as information processing and cryptography.

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DP0666256 Prof CE Franklin

Approved Project Title **The inhibition of muscle disuse atrophy in burrowing frogs**

2006 : \$184,000
2007 : \$165,000
2008 : \$165,000
2009 : \$165,000
2010 : \$165,000

Primary RFCD 2706 PHYSIOLOGY
APF Prof CE Franklin

Administering Institution The University of Queensland

Project Summary

Prolonged muscle disuse, as a consequence of limb immobilisation, extended bed-rest or space travel, can lead to pathological changes resulting in muscle wasting. By examining a unique Australian frog that burrows underground and remains immobile for 9-12 months, and which shows no muscle wasting, we will significantly advance our understanding of the physiological mechanisms that inhibit muscle atrophy.

Benefits of conducting this research will include:

- understanding the role of antioxidants and endogenous opioids in reducing muscle wasting
- training of postgraduate students
- stimulating collaboration between The University of Queensland and CSIRO Livestock Industries.

DP0663300 Prof PR Freebody; Dr CA Christensen; Dr NM Bahr; Dr AH Wright

Approved Project Title **Disciplinary and classroom practice: Epistemological issues in the analysis and improvement of teaching and learning.**

2006 : \$94,000
2007 : \$83,000
2008 : \$92,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Institution The University of Queensland

Project Summary

Demands on levels of content and technical knowledge are accelerating from many employment sectors in Australia and elsewhere. In addition, there is an increasing need to apply knowledge to complex problems in innovative and flexible ways and in authentic settings not readily simulable in traditional schooling. The proposed project addresses fundamental questions about epistemology, curriculum, and everyday classroom practice. It offers novel and evidence-based approaches to the building of discipline-based knowledge, and thus has powerful implications for the revitalising of Australian education to meet the urgent requirements of new economic, technological, and cultural times put pressures on education.

DP0665316 Dr C Gaus; Dr R Weber; Dr B Kuch

Approved Project Title **Formation, degradation and migration of a yet unidentified POP source**

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

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

Administering Institution The University of Queensland

Project Summary

Australia has recently ratified the Stockholm Convention, targeting persistent organic pollutants (POPs) for global reduction and elimination. A significant gap exists, however, in understanding sources and pathways of POPs in Australia, and subtropical/tropical environments. Previous research has shown an extensive POP contamination in coastal Australia, and exposure of biota to elevated levels. The present study will evaluate the formation, degradation and migration of POPs, and their significance to Australia's past, present and future emissions. The outcomes will allow identification of sources, their prioritization for elimination and exposure prevention, and ultimately serve to protect the environment and human health in Australia.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665426 A/Prof IR Gentle; Prof GJ Ashwell; Dr GJ Foran

Approved Project Title **Greatly improved rectification by molecular diodes**

2006 : \$95,000
2007 : \$88,000
2008 : \$90,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Institution The University of Queensland

Project Summary

Society has already seen dramatic benefits from microtechnology, which has made possible most of the devices that we take for granted. The limits of miniaturisation using current technology are rapidly being reached, and the next stage is in the realm of nanotechnology. The goal of the field known as molecular electronics is to reach the point where electronic components are composed of single molecules or single molecular layers. In this field the smallest active component is the molecular diode, and this project is focussed on achieving practical performance from molecular diodes, as a crucial first step in achieving miniaturisation far beyond anything now possible.

DP0662750 Prof TJ Gonda; Dr S Ishii

Approved Project Title **Function and regulation of the Schlafen gene family: novel regulators of blood cell proliferation and function.**

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

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

The immediate outcomes of the proposed research will be in fundamental knowledge and understanding of important cellular and biological processes in which the Schlafen genes are involved. In particular, Schlafen genes are likely to play a role in inflammatory responses and in blood cell growth. These processes clearly have relevance to a range of major human (and animal) diseases including infectious disease, auto-immune disease and leukaemia, and thus a long-term outcome may be improved treatments for such disease.

DP0666126 Dr GJ Goodhill

Approved Project Title **Wiring up the nervous system: how do axons detect molecular gradients?**

2006 : \$125,000
2007 : \$108,000
2008 : \$108,000

Primary RFCD 3207 NEUROSCIENCES

Administering Institution The University of Queensland

Project Summary

This project will improve our understanding of how the nervous system becomes wired up during development. This will ultimately allow better therapies for some types of developmental disorders, and for repairing damaged connections for instance in the spinal cord. The theoretical models developed will improve our understanding of the computations necessary to generate appropriate wiring of the nervous system, which may facilitate the development of self-organizing computing devices. The project will also provide unique research training at the interface of biology and computation, building capacity for such interdisciplinary research throughout Australia.

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DP0664415 A/Prof ME Goos

Approved Project Title **Designing technology-enriched pedagogy in secondary mathematics education**

2006 : \$45,683

2007 : \$30,000

2008 : \$30,000

Primary RFCD 3303 PROFESSIONAL DEVELOPMENT OF TEACHERS

Administering Institution The University of Queensland

Project Summary

The Australian Government's "Agenda for Action" emphasises the need to foster innovation in mathematics teaching and teacher education, and encourages teachers to embrace technologies that enhance student learning. Yet international research shows that successful innovation in teaching with technology has been elusive. This project will develop new theoretical understanding of why technology-related innovation in secondary school mathematics teaching takes hold in some educational settings but not others. The findings will lead to practical recommendations for design of teacher professional development programs, and shed light on reasons why teachers may embrace or reject educational change.

DP0663048 Prof SF Gray; A/Prof P Gray; Mr JT Alcock

Approved Project Title **Capital Management in a Stochastic Earnings Framework**

2006 : \$110,000

2007 : \$70,000

2008 : \$90,000

Primary RFCD 3503 BANKING, FINANCE AND INVESTMENT

Administering Institution The University of Queensland

Project Summary

Many large Australian firms have on-going capital management programs. These programs are aimed at ensuring that the firm maintains an optimal capital structure. This is often done according to rules of thumb or benchmarked against a few financial ratios. To the extent that more rigor can be introduced into the analysis of optimal capital structure, there is a clear benefit to Australian firms. Of course, the reason firms engage in capital management initiatives in the first place is to lower their cost of capital and to increase value. Any initiative that lowers the cost of capital of Australian firms will result in increased productivity and economic growth.

DP0663668 Prof WD Hall; Prof HP Bartlett; Prof SP Myers

Approved Project Title **Knowledge and attitudes about life extension technology: public and stakeholder perspectives**

2006 : \$100,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 3299 OTHER MEDICAL AND HEALTH SCIENCES

Administering Institution The University of Queensland

Project Summary

This comprehensive investigation will contribute new knowledge that will help Australians to better cope with the social and economic consequences of an ageing population. New developments in the biosciences promise the possibility of extending human life past 120 years. This study will assist government, healthcare providers and researchers to understand the public reaction to such developments and enable them to plan for the future. The study will contribute to future strategic research and train a future researcher in the priority health goal of ageing well, ageing productively.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666577 A/Prof I Hay; Dr R Fielding-Barnsley; Dr AF Ashman

Approved Project Title **Comparative effectiveness of three literacy teaching approaches for young children with reading difficulties**

2006 : \$80,000

2007 : \$60,000

2008 : \$30,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Institution The University of Queensland

Project Summary

This project addresses concerns expressed by the Minister for Education, Science and Training, and the Australian Senate in regard to the relative poor performance of Australian children in national reading tests. Specifically, the project seeks to identify the most effective early literacy instructional method or methods to redress the growing concern that Australian children are dropping behind in international competitiveness in reading and literacy achievement. The study concentrates on early reading development and to inform on teacher education and classroom teaching practices.

DP0665959 Prof PW Hodges; Dr MW Coppieters; Prof Dr J Van Dieen; Dr A Kaigle

Approved Project Title **Competing demands on the axial muscles: Effects, consequences, compensations and mechanisms**

2006 : \$78,000

2007 : \$68,000

2008 : \$68,000

Primary RFCD 3214 HUMAN MOVEMENT AND SPORTS SCIENCE

Administering Institution The University of Queensland

Project Summary

Back and neck pain are major health issues and are associated with considerable cost to society and an individual's quality of life. A major issue is to identify factors that increase the chance of developing pain. This project will investigate a novel and innovative possibility; that competition between the many functions of the trunk muscles may increase the possibility for injury. We will study how the nervous system coordinates functions as diverse and movement of the spine, breathing, and control of head and eye movement. A key issue will be to identify whether situations arise in which control of the spine is compromised, potentially leading to increased risk of pain and injury. Such data can aid prevention and rehabilitation.

DP0665174 Prof MS Humphreys

Approved Project Title **The Control of Memory Access**

2006 : \$75,000

2007 : \$55,000

2008 : \$65,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

The topic of control processes in memory access is central to most of the big questions about human memory such as; why we forget, what produces spectacular and tragic memory failures (e.g., lighting a match to check the level of petrol in a tank) and the role of context in familiarity and recollection. Because of the centrality of the problems addressed there will be many applications for the results. The long term results will include better models for human operators which can be used in both civilian (e.g., air traffic control) and military applications. Other areas of application will include how we measure memory impairment, why we make errors in industrial settings, and the nature of memory deficits as we age.

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DP0664608 Dr OG Jepps

Approved Project Title **Modelling of transdermal transport using computational molecular simulation**

2006 : \$90,000

2007 : \$75,000

2008 : \$75,000

Primary RFCD 2405 CLASSICAL PHYSICS

APD Dr OG Jepps

Administering Institution The University of Queensland

Project Summary

Through molecular simulation, we aim to model the transport of a variety of molecules through lipid bilayers typical of human skin, identifying key transport mechanisms and properties. We anticipate that this work will provide insight into existing transdermal delivery data, helping to identify relations between the physicochemical properties of a molecule and its transport properties. Ultimately, such knowledge can facilitate the development of more efficient transdermal drug delivery, which offers significant advantages over oral delivery (which leads to high waste and variability due to drug loss in the stomach and liver) and intravenous delivery (which raises compliance issues due to the adverse psychological response of patients).

DP0666927 Prof J Keller; Dr Z Yuan; Prof W Verstraete

Approved Project Title **Novel Concept for Wastewater Treatment with Integrated Power Production based on Microbial Fuel Cells**

2006 : \$300,000

2007 : \$270,000

2008 : \$270,000

2009 : \$230,000

2010 : \$230,000

Primary RFCD 2911 ENVIRONMENTAL ENGINEERING

APF Prof J Keller

Administering Institution The University of Queensland

Project Summary

Microbial fuel cells are a novel process concept that enables organics, such as sugars, to be converted directly to electricity with the help of naturally occurring microorganisms. This technology has particularly exciting applications in the environmental field, namely in wastewater treatment. It offers significant benefits over current processes, particularly reduced energy consumption or even electricity generation and lower sludge production. This project will demonstrate the performance and application of such microbial fuel cells for the removal of organic and nitrogen-based pollutants from wastewater. If successful, this technology offers major advances in both water treatment and renewable energy aspects.

DP0665814 Prof B Key

Approved Project Title **Assessing gene function in the developing brain using zebrafish as a model system**

2006 : \$130,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2705 ZOOLOGY

Administering Institution The University of Queensland

Project Summary

As the average life expectancy in western countries increases there is an increasing incidence of mental health problems in the general population. Therapeutic approaches to Alzheimer's and Parkinson's disease as well as to brain injury arising from stroke rely on a thorough understanding of the molecular and physiological mechanisms of normal growth of this tissue. These are the very processes that need to be reactivated in these diseases for recovery of function. This project seeks to understand normal development of the brain and in doing so it will expose novel targets for therapy in the aged.

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DP0666329 Dr AY Klimenko

Approved Project Title **New approach to turbulent combustion modelling based on Multiple Mapping Conditioning**

2006 : \$60,000

2007 : \$50,000

2008 : \$50,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Institution The University of Queensland

Project Summary

The project ensures that Australia remains at the front line of international development of new tools and approaches designed to model turbulent combustion. Improvements in modelling techniques will have a direct effect on optimisation of the industrial energy production from conventional sources and will assist in resolving the associated ecological issues. The project will also train several researches to be qualified to work at the frontiers of modern combustion modelling in gaseous flows.

DP0666572 Prof MF Lavin; Prof PJ Robinson

Approved Project Title **Identification of functionally important autophosphorylation site(s) on ataxia telangiectasia and Rad 3 - related (ATR) protein kinase.**

2006 : \$105,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

The integrity of our genetic material must be maintained so that it can be passed on from one generation to the next and also to minimize the risk of cancer and other pathologies in an individual. There are multiple proteins involved in protecting our DNA including several enzymes that detect and signal DNA damage to a series of pathways involved in halting the passage of cells through the cell cycle so that repair can occur. This project studies the mechanism of action of one of these enzymes which will be of benefit in designing new compounds to fight disease.

DP0663937 Dr WR Louis

Approved Project Title **Understanding decision-making in conflict: Group power, norms and cost-benefit analyses**

2006 : \$58,571

2007 : \$30,000

2008 : \$40,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

Conflict is common and costly. Racial, religious, and political groups waste time, money, energy, and even lives when conflicts stagnate or escalate. But researchers still can't predict when groups will cooperate and solve problems quickly, or when others with similar grievances will avoid the issues, allow them to escalate, or erupt into violence. This research looks at the psychological processes that shape so-called 'irrational' conflict behaviour. It tests the idea that group-level factors, such as identity, power, and norms, can explain the logic of 'senseless' apathy, grumbling, and violence. The results will improve our ability both to predict conflict dynamics and to manage them.

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DP0664967 Dr AJ Lowe; Dr AR Clarke; Dr PM Schenk; Prof Dr LH Rieseberg; Prof RJ Abbott

Approved Project Title **Why do only some exotics become invasive? Combining ecological and genomic approaches to address alternative hypotheses in a recent Australian weed**

2006 : \$217,000

2007 : \$172,000

2008 : \$172,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Queensland

Project Summary

This project will specifically test alternative hypotheses about how weeds become invasive. As invasive weeds affect both agricultural and native ecosystems equally, research on understanding the mechanisms of weed invasion is critical. Outcomes will benefit Australia by allowing better prioritisation of management against exotic plants already in the country by providing predictive tools to estimate likelihood of spread. For formal Pest Risk Analysis by regulators (eg Biosecurity Australia), our project will provide genomic tools by which the potential weediness of a regulated plant can be assessed through genetic screening, and forms part of an international effort to identify 'weedy genes'.

DP0665859 Dr AJ Lowe; Dr M Rossetto; Dr DM Crayn; Dr MS Pole; Prof D Lambert; Dr PM Hollingsworth

Approved Project Title **Developing biogeographic know-how: Improving species divergence and dispersal estimations to examine geological and climatic evolutionary drivers**

2006 : \$115,000

2007 : \$87,000

2008 : \$80,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution The University of Queensland

Project Summary

Anthropogenic activity over the last 150 years is now dramatically changing our global climate and ecosystems. The impact on biodiversity is already evident, and large-scale floral and faunal extinctions are predicted. This study unites a cohort of international experts in an interdisciplinary team to develop new molecular and mathematical methods to expand our fundamental knowledge on how geological and global climate change have affected our world's species components and ecosystems in the past. This research is of environmental significance and global importance as it will improve our ability to predict how species behave under future predicted climate scenarios.

DP0666345 Prof GM Lu; Dr L Wang; Dr J Zou; Prof S Kaliaguine

Approved Project Title **Charge-driven self-assembly of nanocomposites of ionic polymers and oxide nanoparticles**

2006 : \$230,000

2007 : \$200,000

2008 : \$200,000

2009 : \$175,000

2010 : \$175,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

QEII Dr L Wang

Administering Institution The University of Queensland

Project Summary

This project addresses the materials needs in platform technologies for more efficient and cleaner means of generating energy and utilising energy. It also aims at better catalysts for cleaner chemical processes. The novel nanocomposites with significantly increased active ionic sites and higher ionic conductivity, and better activity in catalysis will lead to possible new breakthroughs in technologies for energy, environmental and self-cleaning materials. The fabrication approach developed are also applicable to other functional nanomaterials, providing new opportunities for innovative nanotechnology to clearer and greener chemical and energy industries.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664564 A/Prof JL Martin; A/Prof JC Bardwell; Prof GL Grunewald; Dr MJ McLeish

Approved Project Title **Innovative Approaches to Membrane Protein Crystallography & Drug Discovery**

2006 : \$120,000

2007 : \$83,000

2008 : \$83,000

Primary RFCD 2708 BIOTECHNOLOGY

Administering Institution The University of Queensland

Project Summary

Membrane proteins make up around 30% of the predicted products from our human genome, are critical for life, and represent the targets of biological agents like hormones and toxins as well as most drugs. Yet these proteins have persistently defied our best efforts to study them: we know very little about what they do or what they look like. This project is aimed at cracking the problem of membrane proteins, while at the same time developing screening methods that can be used to design drugs against them. The long-term benefits to the community will include fundamental new knowledge and the development of new technologies and pharmaceuticals.

DP0664638 Prof NG Martin; Dr MJ Wright; Prof GM Geffen; Dr M Luciano

Approved Project Title **Locating genes for cognitive traits using linkage and association analyses**

2006 : \$180,000

2007 : \$165,000

2008 : \$165,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

Our study is the 1st in the world to find significant linkage for IQ. The dataset is one of only 2 such in the world (based on sample size, range & type of measures). Identifying genes for cognitive ability using healthy subjects is important in understanding individual differences in normal cognitive functioning, but it may also provide clues into the underlying mechanisms of impaired cognitive ability. Diverging conditions like reading disorder, schizophrenia, depression, alcoholism, and dementia all share deficits in cognitive ability. Downstream practical applications of identifying 'genes for cognition' include better educational, behavioural and biomedical management of learning and memory disorders, and other intellectual disabilities.

DP0665056 Dr MG Mason; A/Prof GE Schaller

Approved Project Title **Regulation of ion homeostasis by two-component signalling elements**

2006 : \$105,000

2007 : \$87,000

2008 : \$87,000

Primary RFCD 2704 BOTANY

APD Dr MG Mason

Administering Institution The University of Queensland

Project Summary

Dryland salinity is continuously claiming Australian lands and is a serious threat to our agricultural industry, native flora and fauna, and infrastructure. Attempting to feed an increasing population whilst agricultural land is disappearing, places an ever-increasing burden on our remaining land. While there is no simple solution to this problem, understanding how plants regulate cellular ion concentrations will help to generate plants that are suitable for restoration of damaged lands or crop plants that are more tolerant to saline soils. Furthermore, knowledge acquired from the proposed project will also be useful for generating healthier crop plants with enhanced levels of ions essential for the human diet.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0667246 Prof JS Mattick

Approved Project Title **Intron encoded RNA regulatory networks in yeast**

2006 : \$165,000
2007 : \$145,000
2008 : \$145,000

Primary RFCD 2702 GENETICS

Administering Institution The University of Queensland

Project Summary

This project has the capacity to transform our understanding of the evolution, development and genetic variation of complex organisms, as well as the self-organization of complex systems in general. The national and community benefits of the project will be to maintain Australian leadership in advanced genetics and genome-phenome informatics. It will provide a platform for many applications in biology and biotechnology, including new genetic diagnostics and an informed basis for the engineering of complex traits in agriculture. The project will also provide insights into the structure of biological communication and control systems with applications in information science and the programming of integrated complex systems in other domains.

DP0667029 Dr CA McAlpine; A/Prof SR Phinn; Dr DV Pullar; Dr JA Ludwig

Approved Project Title **Beyond discrete landscape metrics: spatial analysis tools and surface textural measures for quantifying gradients in landscape structure.**

2006 : \$160,000
2007 : \$110,000
2008 : \$110,000

Primary RFCD 2910 GEOMATIC ENGINEERING

Administering Institution The University of Queensland

Project Summary

The project will make an important contribution to an Environmental Sustainable Australia, especially the sustainable use and management of Australia's biodiversity. The focus is Australia's biodiversity hotspots in northern Australia, where fauna species are threatened as a result of habitat modification and biological invasions. The landscape analysis tools and supporting knowledge will allow for more effective landscape-level conservation strategies to be developed in northern regions by assisting researchers and managers to answer key questions about how to manage the structure of native vegetation for the long-term conservation of fauna populations. The project will also deliver benefits for conserving marine biodiversity.

DP0664410 Prof JR McColl-Kennedy; Prof P Patterson; A/Prof AK Smith

Approved Project Title **Customer Rage Spectrum Emotions in Service Failure Encounters: Linking Experience, Expression, Behaviour and Organisational Responses**

2006 : \$90,000
2007 : \$60,000
2008 : \$90,000

Primary RFCD 3502 BUSINESS AND MANAGEMENT

Administering Institution The University of Queensland

Project Summary

Customer rage has recently received considerable attention in the press. Yet, organisations are ill-equipped to deal with this disturbing phenomenon. This ground-breaking research will help business and government service organisations better understand and respond to customer rage in order to avoid economic, social and emotional losses, and minimise damage to property and persons. Such practices should result in stress reduction among consumers and front-line employees, thereby lowering society's healthcare costs and improving citizens' overall quality of life. Since the research examines how customer rage varies across East-West cultures, the results will also have significant international impact.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665016 A/Prof DJ Mee; Em/Prof RJ Stalker

Approved Project Title Enhancing scramjet performance by boundary layer combustion

2006 : \$100,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2902 AEROSPACE ENGINEERING

Administering Institution The University of Queensland

Project Summary

Australia has developed a strong international reputation over the past 20 years for excellence in research into hypersonic flight technologies. This helps to reinforce the fact that this is a country in which advanced technologies can be conceived and developed. Australian companies and agencies are already collaborating with and are being supported by international organizations to develop further hypersonic flight technologies. Achieving another significant advance in this area by demonstrating significant reductions in frictional drag on hypersonic vehicles will keep us at the forefront of this field and lead to continued international support and collaboration.

DP0663047 A/Prof PC Memmott; Dr SG Ulm; A/Prof IA Lilley; A/Prof ND Evans; Dr EC Stock; A/Prof NG White; Dr SM van Holst Pellekaan; Prof DS Trigger; Dr RP Robins

Approved Project Title Isolation, Insularity and Change in Island Populations - an Interdisciplinary Study of Aboriginal Cultural Patterns in the Gulf of Carpentaria

2006 : \$90,000

2007 : \$90,000

2008 : \$90,000

2009 : \$55,000

2010 : \$40,000

Primary RFCD 3703 ANTHROPOLOGY

Administering Institution The University of Queensland

Project Summary

The project's national benefits centre on its contribution to safeguarding Australia and to an environmentally sustainable Australia. The participation of northern Indigenous people is critical to border protection policies and procedures. This project will help revitalise the Carpentaria Land Council's Aboriginal Rangers scheme, which has a potential role in safeguarding the nation's northern approaches, including combating feral plant and animal importation, Coastwatch surveillance and marine habitat protection. The geological research on sea level and climatic history in the Gulf of Carpentaria and associated coastal geomorphological impacts will contribute to predictive models on global warming and its consequences (sea-level rise).

DP0665467 Dr NW Menzies; Mr G Kerven; Mr JV Hanna; Prof Dr WJ Horst

Approved Project Title Plant cell wall - aluminium interactions: a role in aluminium stress

2006 : \$145,000

2007 : \$135,000

2008 : \$135,000

Primary RFCD 3002 CROP AND PASTURE PRODUCTION

Administering Institution The University of Queensland

Project Summary

Soil acidity, resulting in Al toxicity, affects production on circa 50% of Australia's intensively used agricultural land, resulting in 8.5 times more foregone agricultural income than dryland salinity (National Land and Water Resources Audit, 2001). Often, remediation with lime is not possible or affordable. By understanding Al reactions with cell wall components, we aim to identify root parameters related to Al resistance by plants. These parameters will be useful as selection markers to identify and breed Al-tolerant crop genotypes. This, in turn, will improve yields and farm profitability, allowing farmers to use lime to prevent further acidification. This increases sustainability of cropping operations on the 50 Mha with acid soils.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663936 Ms K Miller

Approved Project Title **A unified theory of the individual - a central problem in analytical philosophy**

2006 : \$74,340

2007 : \$74,340

2008 : \$74,340

Primary RFCD 4401 PHILOSOPHY

APD Ms K Miller

Administering Institution The University of Queensland

Project Summary

This project will further increase Australia's already high profile in analytic philosophy. This will foster an intellectual environment within Australia that will attract highly skilled overseas academics who bring knowledge and funding to Australia, benefiting both Australian researchers and students. This will in turn attract overseas fee-paying students who bring economic and cultural benefits to Australia.

DP0664888 Dr MJ Monteiro; Dr JT Blanchfield; Prof V Percec

Approved Project Title **Next generation polymer nanostructures**

2006 : \$240,000

2007 : \$180,000

2008 : \$200,000

Primary RFCD 2505 MACROMOLECULAR CHEMISTRY

Administering Institution The University of Queensland

Project Summary

The project will significantly advance the knowledge base of polymer science and related fields through the preparation of previously unavailable novel and well-defined nanostructures. These structures will be suitable for use in drug and gene delivery and high strength coatings providing Australian products with advanced features and capabilities, significantly improving product performance. A direct application of this project will be to develop the structures for use within a synthetic GAS vaccine. The knowledge obtained through this application will advance the development of synthetic vaccines by providing an understanding of how these structures function in the body.

DP0666203 Prof PR Mora; Dr H Xing

Approved Project Title **Supercomputer Simulation and Risk Evaluation of Tsunami Generation Induced by Earthquakes**

2006 : \$95,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2602 GEOPHYSICS

Administering Institution The University of Queensland

Project Summary

New hotspot forecasts show that great earthquakes are likely to occur during the next decade in the Western Pacific north of New Zealand which potentially poses a tsunami risk to Australia. The project will enable this risk to be reliably assessed thereby providing the information needed to properly manage this risk thus addressing the national research priority: Safeguarding Australia. Building on extensive geo-data and Australia's forefront position in solid earth simulation via investment in the ACcESS Major National Research Facility, the project provides an opportunity for Australia to play a key role in constructing next generation real-time tsunami warning systems.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666275 Prof JM Najman; Prof GM Williams; Dr W Bor; Asst Prof MJ O'Callaghan; Dr AM Clavarino

Approved Project Title **Parental marital conflict and marital change: effects on child, adolescent and young adult developmental outcomes**

2006 : \$100,000

2007 : \$100,000

Primary RFCD 3212 PUBLIC HEALTH AND HEALTH SERVICES

Administering Institution The University of Queensland

Project Summary

Aggressive and/or delinquent behaviour, poor school performance and learning, an inability to develop social relationships or successfully join the workforce have all been related to family structure and family functioning. Unfortunately, current policy is poorly informed as previous studies largely involve clinical samples or small population sub-groups. This study is the only Australian 21 year prospective assessment of the way changes in marriage are impacting on the development of children and adolescents and on the longer term outcomes for young adults.

DP0665365 Prof TP Oei; Dr MJ Hornsey

Approved Project Title **Exploring the link between group processes and outcomes of group psychotherapy**

2006 : \$90,000

2007 : \$70,000

2008 : \$80,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

In Australia an estimated 20% of people suffer from mental disorders for which group psychotherapy is a treatment of choice. This project has the potential to deliver direct benefits to these patients by optimizing the way group psychotherapy is structured and delivered, thus reducing emotional suffering as well as reducing the cost of treatment. As a result, it would have tremendous implications for the treatment of mental health problems nationally and internationally.

DP0662761 Prof RG Parton; Dr BJ Marsh

Approved Project Title **High Resolution EM Tomography of Specialised Plasma Membrane Domains**

2006 : \$110,000

2007 : \$85,000

2008 : \$85,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

This project will provide National benefits in two major areas. Firstly, these studies will greatly increase our understanding of the cellular structures which are crucial to the functioning of cells in the body. Understanding the structure of the components of animal cells in three dimensions will provide long-term benefits in the quest to understand how a cell works in health and what goes wrong in disease. Secondly, this project will allow us to develop the new method of electron microscope tomography and apply it to a crucial question in biology. This will be a vital technique for Australian investigators in the coming years and this project will allow scientists and students to be trained in these state-of-the-art techniques.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663001 Prof CC Peterson; Dr VP Slaughter; Prof HM Wellman

Approved Project Title **Social Influences on Five Key Steps in Understanding Mind for Children with Autism, Deafness or Typical Development**

2006 : \$60,000

2007 : \$55,000

2008 : \$65,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

Via new knowledge on five crucial steps in the growth of social understanding, our findings will serve the ARC's Research Priority #2 to promote good health and a healthy start in life. We will discover what kinds of parenting, social interaction and conversation foster optimal progress through the steps for typical children, and how the delays discovered in our earlier research among those with autism or deafness can be offset or overcome. Also, Australia's position as a world leader in scientific studies of child social cognition will be further strengthened by our methodological and theoretical contributions.

DP0663893 A/Prof SR Phinn; Dr PJ Mumby; Dr EF LeDrew; Dr AG Dekker

Approved Project Title **Coral Reefs - Innovative Satellite Image Mapping Techniques**

2006 : \$100,000

2007 : \$90,000

2008 : \$80,000

Primary RFCD 2910 GEOMATIC ENGINEERING

Administering Institution The University of Queensland

Project Summary

Two primary outcomes are expected from this project, the first is aimed at solving a fundamental challenge to understanding and managing coral reefs in Australia and worldwide. The optimal reef mapping method(s) will enable coral reef monitoring and management programs in Australia and internationally to make full use of satellite and airborne image data sets. Secondly, the project will significantly advance the capabilities of remote sensing applications in coral reefs, by providing a unique international test of current state of the art algorithms. In combination, these outcomes will enable Australia to continue to play a role as the world's leading developer and provider of solutions for coral reef monitoring and management.

DP0663867 Prof HP Possingham; Dr RL Pressey

Approved Project Title **Integrating multiple conservation values for protection and restoration of native vegetation**

2006 : \$150,000

2007 : \$130,000

2008 : \$130,000

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

Administering Institution The University of Queensland

Project Summary

The project will underpin Australia's ability to enhance its competitive advantages in an environmentally sustainable fashion. We will develop better methods for integrating conservation goals related to biodiversity, soil conservation, water quality, salinity mitigation and carbon sequestration to identify areas where multiple benefits can be obtained and funding can be spent more effectively. Our results and techniques will be of immediate use to national, state and local governments, catchment authorities, and community groups. The project will maintain Australian scientists at the international forefront of environmental management and provide high-quality training for young scientists.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663935 A/Prof TC Ralph

Approved Project Title **Optical Quantum Computation**

2006 : \$148,680
2007 : \$148,680
2008 : \$148,680
2009 : \$148,680
2010 : \$148,680

Primary RFCD 2404 OPTICAL PHYSICS
APF A/Prof TC Ralph

Administering Institution The University of Queensland

Project Summary

The study of the storage, communication and processing of information stored in quantum systems - quantum information science - is recognized as key underpinning knowledge for future technologies. Technologies of current fundamental and popular interest such as quantum computation and teleportation are likely to form the basis of future communication and computation systems with far greater power and versatility than those of today. Having a stakehold in the development of these technologies will be of significant national benefit for Australia.

DP0666772 Dr RW Remington

Approved Project Title **A Scalable Theory of Behavior Composition for Practical Engineering Models of Human Performance**

2006 : \$210,000
2007 : \$150,000
2008 : \$180,000
2009 : \$180,000
2010 : \$180,000

Primary RFCD 3801 PSYCHOLOGY
APF Dr RW Remington

Administering Institution The University of Queensland

Project Summary

Minimizing human error and maximizing human performance is a major design goal in safety critical systems. The development of methods for affordable human performance modeling has widespread applicability for evaluating user-system interfaces. The compositional method explored here has been shown to make accurate predictions reduce model development time by an order of magnitude. Large safety critical applications, such as military or air traffic control systems, would benefit greatly. The proposed work tests whether the compositional methods will scale to more complex domains. The work will be coordinated with Australian industry, academia, and government research efforts.

DP0666359 Prof V Rudolph; Dr P Massarotto

Approved Project Title **Multicomponent gas counter-diffusion in coal**

2006 : \$80,000
2007 : \$75,000
2008 : \$75,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Institution The University of Queensland

Project Summary

Coalbed methane resources in Australia surpass \$20billion at present gas prices. Using CO₂ as an enhancement fluid, recovery of methane can potentially be improved by 50% adding a further \$10b value, simultaneously permanently and safely sequestering the CO₂, with possible carbon credits of up to \$15b. The nature of the simultaneous exchange of CO₂, methane and other gases within the coal dictates many of the engineering requirements for optimal exploitation. It underlies the development of coal gas reservoir simulators, which currently do not incorporate this critical feature. This project is directed at understanding that counterflow and exchange.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665997 Prof TK Saha; Dr ZY Dong; Prof GF Ledwich; Prof KP Wong; Prof YV Makarov

Approved Project Title **Advanced Planning Tools for the Prevention of System-wide Blackouts of Large Power Systems**

2006 : \$58,000

2007 : \$84,000

2008 : \$84,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

Administering Institution The University of Queensland

Project Summary

In 2003 there had been major power blackouts in US/Canada, Italy and in Scandinavia leading to billions of dollars of lost production and had raised concern about national security. Prevention of blackout should be one of the highest priorities of the electricity industry. National security for any critical infrastructure of any country is more vulnerable for a prolonged blackout. This project will provide comprehensive planning tools to prevent blackouts in the Australian National Electricity grid. Any benefit to electricity industry will finally result in further benefits to the national economy and security as a whole.

DP0665587 Prof MR Sanders; A/Prof A Ralph

Approved Project Title **The evaluation of a parenting intervention to prevent adverse developmental outcomes for children following family breakdown**

2006 : \$115,000

2007 : \$75,000

2008 : \$73,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

This project will be a major step forward in providing an evidence-base for interventions with divorced parents in Australia. Family Transitions Triple P - Positive Parenting Program is a theoretically based intervention that addresses the Australian Government's emphasised need of providing families with strategies to resolve relationship disputes and reduce the emotional costs to families experiencing divorce. Once evaluated for effectiveness, the collaboration of this project with Relationships Australia will enable the program to be readily accessible to the divorced parents in Australia.

DP0666852 Dr MA Schembri; Prof AG McEwan

Approved Project Title **Safety in numbers: Bacterial aggregation and adaptation to oxidative stress**

2006 : \$85,000

2007 : \$60,000

2008 : \$60,000

Primary RFCD 2703 MICROBIOLOGY

Administering Institution The University of Queensland

Project Summary

This project is a new collaboration which links two molecular microbiologists with the complementary skills required to make new insights into the molecular processes that underpin bacterial aggregation and biofilm formation. Biofilms are of immense significance in medical, industrial and environmental settings and so the fundamental information gained from this project will have wider relevance to the field of microbiology. An outcome of this proposal will be fundamental knowledge about the production of surface adhesins that will form the basis for rational treatment of disease in the future. Prevention of aggregation and biofilm formation would make bacterial populations more susceptible to conventional antibiotic treatment.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0665118 Dr KD Scott; Prof MP Zalucki

Approved Project Title Does the origin of *Helicoverpa punctigera* populations explain their susceptibility to agricultural insecticides?

2006 : \$120,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 3002 CROP AND PASTURE PRODUCTION

Administering Institution The University of Queensland

Project Summary

By establishing the geographic origin, and migration patterns of *H. punctigera* populations (by gene-flow), and directly relating it to the occurrence and persistence of insecticide resistance in Australia (by describing the movement of insects with known insecticide susceptible/resistant status), this research will greatly advance our understanding of how insecticide resistance develops and how it spreads. This knowledge will enable the agricultural industry to use insecticides so as to reduce the frequency of insecticide spray failures, and reduce crop losses caused by insecticide resistant pest outbreaks.

DP0662755 Dr R Shao

Approved Project Title Recombination of mitochondrial genomes: what can we learn from chigger mites?

2006 : \$87,870

2007 : \$84,155

2008 : \$88,032

Primary RFCD 2702 GENETICS

APD Dr R Shao

Administering Institution The University of Queensland

Project Summary

This project will bring three benefits to Australia. First, it will enhance Australia's research capacity in the fields of organelle genomics and evolutionary biology. Second, it will yield highly skilled young researchers: a postdoctoral fellow (Shao), a PhD student and two BSc Honours students. Third, it will generate new knowledge about genome recombination in animal mitochondria. Recombination is a fundamental, yet poorly understood issue in mitochondrial genomics and evolutionary biology. Knowledge from this project will also improve our understanding of other important issues that are associated with animal mitochondria; like the mechanisms of mitochondrial disease and ageing, and the evolution of modern humans and other animals.

DP0664925 Dr GA Skilleter; Prof AJ Underwood

Approved Project Title Ecological consequences of global warming: predicting effects on biodiversity on intertidal assemblages on the east coast of Australia

2006 : \$130,000

2007 : \$116,000

2008 : \$116,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution The University of Queensland

Project Summary

Understanding what conserves biodiversity is a crucial challenge for Australian science. This research will provide critical information on the consequences of global climatic change: southerly shifts in distributions of animals due to rising temperatures; vertical shifts due to rising sea level and changes in amounts of food for grazing species. This information will underpin the future management of conservation and will improve understanding on issues such as how and why species are able to invade new areas, the effects on the resident species and how species change distribution in relation to the availability of specific needs for habitat.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664405 Dr VP Slaughter

Approved Project Title **Objects or agents: Early development of knowledge about human hands**

2006 : \$52,000

2007 : \$40,000

2008 : \$50,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

It has long been known that human faces are especially interesting to infants, and our recent ARC-funded work demonstrated that infants' knowledge about human faces emerges long before knowledge of the whole human body shape. Like faces, hands are often the focus of action and communication between infants and their peers or caregivers. The purpose of the proposed studies is therefore to investigate whether human hands are similar to faces in being highly salient and subject to precocious learning in infancy. The proposed studies will test this hypothesis, and will lay the foundation for new techniques that could foster improved social understanding in young children whose developmental disorders make face-to-face interaction aversive.

DP0666627 A/Prof ML Smythe; A/Prof P Adams

Approved Project Title **Common recognition elements in protein active sites: Improving the efficiencies of drug discovery**

2006 : \$90,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution The University of Queensland

Project Summary

The three key contributions of biotechnology to the pharmaceutical industry are the identification of novel therapeutic targets, the creation of libraries of chemical diversity, and the high throughput screening of the libraries against the targets to create new leads. Australian research institutes and biotechnology companies are strong in the identification of novel targets, but weaker in the other two areas. The research outlined in this proposal has the potential to lead to efficient drug discovery. Success in this project will support the Australian pharmaceutical sector, lead to job creation and will have social impact through the generation of better medicines.

DP0664838 Dr TM Stace

Approved Project Title **Decoherence and Quantum Simulations of Spin-Environment systems**

2006 : \$85,000

2007 : \$80,000

2008 : \$75,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

APD Dr TM Stace

Administering Institution The University of Queensland

Project Summary

The effort to develop quantum technologies relies on our ability to understand and manipulate quantum mechanical objects with great precision. In order to do this, we need to study how such systems interact with their surroundings. Solid-state quantum systems connected to an environment show a rich range of phenomena, such as quantum phase transitions, which are interesting in their own right. This work will better enable experimentalists to develop the techniques required for the future of quantum technology.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664030 Prof AP Street; Dr C Ramsay; A/Prof DM Donovan

Approved Project Title **Security Applications of Combinatorial Puzzles**

2006 : \$92,000

2007 : \$79,000

2008 : \$81,000

Primary RFCD 2805 DATA FORMAT

Administering Institution The University of Queensland

Project Summary

This project provides a basis for improving the implementation and maintenance of key management systems. The application of discrete mathematics to information security will help safeguard Australia, will provide opportunities for Australians to take a leading role in an important area and will develop a research network, bridging both theoretical and practical aspects of mathematics and computer science. The project will enhance Australia's international reputation by establishing collaborations with well-respected international mathematicians and computer scientists. The proposal contains topics suitable for the training of new graduates, allowing them to make high quality original research contributions in a novel and important area.

DP0666925 Dr PM Vasconcelos; Prof K Farley

Approved Project Title **Weathering on Mars and Australian Analogues: Developing Suitable Chronological Tools and Theoretical Approaches**

2006 : \$70,000

2007 : \$60,000

2008 : \$50,000

Primary RFCD 2603 GEOCHEMISTRY

Administering Institution The University of Queensland

Project Summary

The research outlined in this proposal will place Australia at the forefront of Mars exploration research. It will lead to the development of new approaches for the analysis of minerals formed by low temperature water-rock interaction and for the interpretation of geochronological results obtained from supergene minerals. The new analytical approaches developed in this project will have direct application in the study of the paleoclimatological and environmental evolution of Earth and Mars. It will also result in improved understanding of environmental and landscape evolution in Australia, helping to reach the objectives of an Environmentally Sustainable Australia, a national research priority.

DP0663407 Dr GM Wallis; Dr JR Tresilian

Approved Project Title **The initiation and control of action in motor vehicle driving**

2006 : \$80,000

2007 : \$60,000

2008 : \$65,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution The University of Queensland

Project Summary

Every time we pull up to a traffic light or overtake another vehicle our brain is making a whole series of critical decisions about when and how to carry out the manoeuvre accurately and safely. This project seeks to better understand the processes involved. Using the latest, high fidelity GPS and accelerometer technology, highly accurate measurements of driver behaviour and vehicle dynamics will be made in a real vehicle. Understanding when and how we carry out these types of basic tasks will play a central role in future brake, suspension and steering system design; will help guide the specifications of road and road sign design; and will help motivate additions or alterations to current driver training programmes.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663787 Prof GL Whitlock

Approved Project Title **Autobiographical Avatars: testimony and emerging technologies of life narrative**

2006 : \$29,450

2007 : \$35,650

2008 : \$45,250

Primary RFCD 4203 CULTURAL STUDIES

Administering Institution The University of Queensland

Project Summary

Australian research has led to new ways of thinking about the ethical, social and political work of these autobiographical genres. This project builds on a national reputation for excellence in this scholarly field, and it promotes writing across the fields of literary studies, and creative and professional writing which are areas of particular strength at the institutional location of this project. Some case studies selected for this project involve people, nations and polities with which the Australian government is engaged in long-term diplomatic, political and military engagements - Iraq and Afghanistan, for example.

DP0663635 Dr SD Wilde

Approved Project Title **Trust and the Changing Moral Economy of Australian Medicine**

2006 : \$95,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 3706 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE

APD Dr SD Wilde

Administering Institution The University of Queensland

Project Summary

There is strong evidence that patients sue their doctors because of inadequate doctor/patient communication, and this has been directly linked to low levels of trust. But unless doctors have become worse communicators over time, poor communication fails to explain recent rises in litigation rates. This historical study will examine the multiple factors affecting changing doctor/patient relationships. It will offer new insights into the circumstances that fostered trust in medicine in the past, which will assist in understanding the current dynamics of changes in trust. This will help policy makers seeking to promote and maintain good health by strengthening the values of trust and reciprocity within Australia's healthcare system.

DP0666855 Dr CM Williams

Approved Project Title **Neurotrophic Active Natural Products: Total Synthesis and Biological Evaluation of Neovibsanins A and B, and Analogues**

2006 : \$90,000

2007 : \$85,000

2008 : \$85,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution The University of Queensland

Project Summary

New chemical entities (drug candidates) that promote neurite outgrowth have significant ramifications to mankind as they have real potential to repair damaged, or grow replacement, nerve cells affected by neuro and central nervous system (CNS) degenerative disease (e.g. Alzheimer's, Parkinson's, Huntington's etc). This scientific endeavour will reveal new drug like molecules for potential biological and clinical application, thereby assisting a substantial proportion of Australians suffering from these debilitating diseases.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666024 A/Prof JE Wilson; Dr CF Tilse; Prof L Rosenman

Approved Project Title **The individual, the family and the state: expectations, intergenerational obligations and constraints in providing for old age**

2006 : \$75,000

2007 : \$57,000

2008 : \$90,000

Primary RFCD 3702 SOCIAL WORK

Administering Institution The University of Queensland

Project Summary

Intergenerational equity is a principle underpinning policy debates around financing retirement and care in older age. Enhanced understanding of this cohort's expectations and obligations will assist in policy development around financing retirement and paying for care that takes account of this cohort's expectations and obligations. Further, exploring the expectations underpinning intergenerational exchanges from this cohort's perspective will assist in understanding the dynamics around these exchanges and lay the ground work for future research into factors that facilitate cross-generation family functioning.

DP0664395 Dr AS Yap

Approved Project Title **Balancing cadherin-actin cooperation: the key regulatory role of Ena/VASP proteins**

2006 : \$88,000

2007 : \$83,000

2008 : \$83,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Institution The University of Queensland

Project Summary

This project analyses a fundamental mechanism of how cells work together in tissues. Understanding the fundamental mechanisms of how cells work will provide important basic scientific information to enrich the scientific expertise in Australia and its part in the international community, generate insights relevant for understanding human disease and physical degeneration, and support the training of young scientists in Australia.

DP0666762 Dr Z Yuan; Dr PA Lant; Prof J Keller

Approved Project Title **A Fundamental Understanding of Methane Driven Denitrification**

2006 : \$210,000

2007 : \$170,000

2008 : \$180,000

Primary RFCD 2911 ENVIRONMENTAL ENGINEERING

Administering Institution The University of Queensland

Project Summary

Eutrophication in waterways due to the presence of nutrients including nitrogen is a well-recognised environmental problem. Moreton Bay, for example, used to receive 3,300 tons of nitrogen each year from point sources. Stringent nitrogen discharge limits have therefore been imposed on most wastewater treatment systems across Australia. Nitrogen removal from wastewater is commonly accomplished in a biological way involving the use of bacteria. The project aims to investigate a particular bacterial community, which is able to perform nitrogen removal from wastewater with methane as a renewable carbon source. The project will therefore lead to more sustainable wastewater treatment systems.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666109 Prof MP Zalucki; Dr BW Cribb; Dr JS Hanan; Prof P Prusinkiewicz; Dr SD Eigenbrode

Approved Project Title **Traversing a treacherous landscape: Modelling caterpillar movement and behaviour on whole plants at multiple scales.**

2006 : \$128,000

2007 : \$118,000

2008 : \$120,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Institution The University of Queensland

Project Summary

How caterpillars move on plants and where they feed is central to developing plants resistant to these insect pests. Our research program will generate computer models of caterpillar behaviour on virtual plants that interact in realistic ways with the changing structure of the plant as it grows, its micro-architecture and environment. We provide a set of tools that will form the cornerstone of important future research agendas in the ecology of foraging caterpillars, optimisation of insecticide spray application, and the development of novel genetically transformed plants for insect control central to the future of Australian agriculture.

DP0663083 Dr Y Zhang; Prof R Sasaki; Prof AA Belavin; Dr W Yang

Approved Project Title **Quantum Integrable Systems and Applications: From Condensed Matter to Quantum Information**

2006 : \$106,000

2007 : \$96,000

2008 : \$98,000

Primary RFCD 2301 MATHEMATICS

Administering Institution The University of Queensland

Project Summary

Quantum integrable systems have produced exciting results and techniques vital in the efforts to achieve the ultimate goal of understanding quantum science beyond perturbation. The proposal gathers four world experts from Australia, Japan and Russia to work on highly interdisciplinary projects designed to resolve fundamental problems in the field, which will underpin the development of emerging technologies. As a result, Australian science will be seen to be at the forefront internationally, and the leading status of Australia in the field will be greatly strengthened. Early career researchers and PhD students will be trained as part of the project, important in enhancing Australia's capability to develop and retain scientific talent.

DP0663272 Prof X Zhou; Dr HT Shen; Dr D Song; Prof PD Bruza

Approved Project Title **Efficient Similarity Query Processing in High Dimensional Databases**

2006 : \$70,000

2007 : \$70,000

2008 : \$70,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Institution The University of Queensland

Project Summary

This project studies a fundamental problem common to a wide range of applications. It contributes to smart use of information, which is vital to the modern knowledge-based economy, by providing an enabling technology to capitalise Australia's huge investment in data collection. Our research is right in the forefront of ICT research, leading the international effort of extending database technologies to support data management and query processing for very large and highly complex data.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0666387 Dr J Zhu; Dr DN Jurcakova

Approved Project Title **Novel Graphitic Mesoporous Carbon Materials for Next Generation Carbon Catalyst Supports and Carbon Electrodes**

2006 : \$125,000

2007 : \$110,000

2008 : \$110,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Institution The University of Queensland

Project Summary

This project will bring about direct application benefits in terms of disclosing novel graphitic mesoporous carbons with high accessible surface area and graphitic framework as catalyst supports and electrode materials. This would lead to advanced processes important to the Australian energy and environmental industries, such as electrical double layer capacitors, greenhouse reduction by hydrogen fuel, and hydrodesulfurization of diesel fuels. The techniques and synthesis strategies developed in this project are also applicable to creating other graphitic mesoporous carbons important to advanced sensors, fuel cells and optoelectronic applications.

DP0663304 Dr J Zou; Prof Z Jiang; Prof KL Wang

Approved Project Title **Controllable growth of semiconductor quantum dots for future nanoelectronic and optoelectronic devices**

2006 : \$100,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Institution The University of Queensland

Project Summary

This project addresses specific National Research Priorities in the areas of breakthrough science, frontier technology and advanced materials. Outcomes will significantly advance the understanding of the self-assembly of semiconductor nanostructures. This project will provide informative guidelines for designing, developing and manufacturing semiconductor nanostructures for future nanoelectronic and optoelectronic devices, which is strategically important to Australia's emerging electronic industry. This project will also enhance the international reputation and impact of Australian research in the internationally focused field of nanoscience and nanotechnology.