

Queensland

The University of Queensland

DP0878140 Dr DH Arnold; Dr PM Grove; Prof OV Lipp

Approved Project Title **Determinants and consequences of conscious visual awareness**

2008 : \$ 75,000

2009 : \$ 52,000

2010 : \$ 54,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Queensland

Project Summary

Usually salient images can disappear from awareness without corresponding stimulus changes. This project is based on an innovative account linking such disappearances to a functional adaptation which facilitates vision in cluttered environments. Project completion will expand Australia's knowledge base, forge links between junior and senior Australian based investigators and provide excellent training opportunities. Publication of research in top-ranking international journals will further promote Australian science abroad. Ultimately, this research will have implications for the design and implementation of artificial visual systems, which must overcome many of the same dilemmas faced by the human visual system in cluttered environments.

DP0881347 Dr SA Beatson

Approved Project Title **The evolution of bacterial pathogenesis: a genomic approach**

2008 : \$ 105,858

2009 : \$ 100,271

2010 : \$ 100,271

2011 : \$ 98,643

2012 : \$ 98,643

Primary RFCD 2703 MICROBIOLOGY

ARF Dr SA Beatson

Administering Organisation The University of Queensland

Project Summary

The outcome of this research will be a better understanding of the genes involved with adaptation to particular pathogenic lifestyles. Specifically, genes that are rapidly evolving in selected bacterial pathogens of medical and veterinary importance will be identified using a bioinformatics approach that exploits the existence of multiple closely-related genome sequences. Such genes encode potential new targets for therapeutic intervention that provide alternatives in the face of emerging antibiotic resistance. Importantly, the methodology developed in this project is broadly applicable to the study of evolution of bacterial pathogenesis in any background: medical, agricultural or horticultural.

DP0880288 A/Prof PV Bernhardt

Approved Project Title **Electrochemically Driven Molybdoenzyme Catalysis**

2008 : \$ 85,000

2009 : \$ 84,000

2010 : \$ 79,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Organisation The University of Queensland

Project Summary

Enzymes that catalyse oxidation and reduction reactions need to exchange electrons with their substrate and this supply of electrons needs to be sustained. Artificially reconstituted systems can be developed where the enzyme is coupled with an electrode and the current (electrons) exchanged during the reaction are measured directly. In this project we will reveal whether some unusual and unexplained electrochemical phenomena seen before are related to the properties of the enzymes themselves or the ways in which their experiments have been conducted.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0880627 Dr CA Beveridge

Approved Project Title **The Other Side: Long-distance Feedback and Cross-talk in the Arabidopsis Branching Gene Network**

2008 : \$ 80,000

2009 : \$ 80,000

2010 : \$ 60,000

Primary RFCD 2704 BOTANY

Administering Organisation The University of Queensland

Project Summary

Shoot structure in nearly all plants impacts on water relations, yield and sustainability. Isolation of novel genes and plant hormone pathways that affect shoot structure should allow us to capture IP for Australia and enhance plant improvement and sustainability. One of the pathways we will investigate produces glucosinolates, small plant-specific molecules that have considerable value as anti-cancer agents in humans. Flavonoids, another pathway regulated in our shoot branching lines, also benefit human health. Graduate students and postdoctoral researchers will gain skills in research management, design, ethics and experimental methods pertinent to the growing biotechnology industry in Australia.

DP0877925 Prof SK Bhatia; Prof SC Smith; A/Prof XS Zhao; Dr H Zhang

Approved Project Title **Quantum Induced Kinetic Molecular Sieving of Hydrogen Isotopes in Nanoporous Materials**

2008 : \$ 150,000

2009 : \$ 140,000

2010 : \$ 100,000

Primary RFCD 2906 CHEMICAL ENGINEERING

Administering Organisation The University of Queensland

Project Summary

This research addresses a key challenge in gas separation; that of separation of deuterium from hydrogen, while advancing the molecular science of adsorption and transport of light gases in molecularly confined spaces. This project has a multitude of benefits for Australia, not only because of the economic potential of deuterium, but because it will see a new generation of Australian researchers trained in multidisciplinary cutting-edge research while addressing several areas of national priority, including breakthrough sciences, and development of frontier technologies, and thereby creating new opportunities for industry.

DP0878615 Dr I Blakey; Adj/Prof TV Chirila; Dr DJ Hill; Dr CJ Hawker

Approved Project Title **Generation of peptidomimetic surfaces for biomaterials applications**

2008 : \$ 190,000

2009 : \$ 190,000

2010 : \$ 180,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

Administering Organisation The University of Queensland

Project Summary

Biomedical implants are increasingly being used for the treatment of a variety of ailments. This project will significantly contribute to the development of these bioengineered constructs, by introducing an innovative method for tailoring the nature of the surface of these materials with structures that mimic the response of biological surfaces. This technology has the potential to promote favourable interactions of cells with biomedical implants, and an initial targeted application will be to use these bioengineered constructs in the treatment of preventable blindness and severe visual impairment, afflictions which affect over 180 million individuals worldwide.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878542 Dr SP Blomberg
Approved Project Title **Advances in Phylogenetic Comparative Methods.**
2008 : \$ 28,418
2009 : \$ 25,000
2010 : \$ 23,000
Primary RFCD 2707 ECOLOGY AND EVOLUTION
Administering Organisation The University of Queensland

Project Summary

An understanding of our biota is impossible without understanding evolution, and developing ways to study it. The outcomes will be useful for biologists conducting theoretically important projects: understanding how and why species have evolved to be the way they are. In addition, the research will be of use to biologists studying more applied questions, such as how to predict whether certain species are likely to become endangered, go extinct, or whether certain species are likely to become invasive and feral. This research will maintain Australia as a leader in evolutionary biology by cementing strong collaborations with world-leading biologists and statisticians.

DP0880159 Prof MW Blows; Dr KL McGuigan
Approved Project Title **Sexual selection and the accumulation of deleterious mutations**
2008 : \$ 160,000
2009 : \$ 158,000
2010 : \$ 155,500
Primary RFCD 2707 ECOLOGY AND EVOLUTION
Administering Organisation The University of Queensland

Project Summary

Mutation is the ultimate source of all genetic variation. Understanding the nature of mutation, its frequency, the distribution of effects, and the forces of selection that remove mutational load from populations is therefore a central concern of genetics. The accumulation of mutational load in endangered species and in human populations, where the forces of selection tend not to operate, has the potential to create serious problems. We will determine the efficacy of sexual selection in preventing deleterious mutations from accumulating in populations. This project will provide research training opportunities in quantitative genetics, an enabling discipline in Biology.

DP0877502 A/Prof PM Bodman; Prof HF Campbell; Prof RW Boadway
Approved Project Title **How does the Structure of Government, in Particular the Extent of Fiscal Decentralisation, Affect Long Term Economic Performance in Australia?**
2008 : \$ 56,024
2009 : \$ 36,402
2010 : \$ 70,000
Primary RFCD 3402 APPLIED ECONOMICS
Administering Organisation The University of Queensland

Project Summary

The research analyses how Australia should best structure its government to maximise long-term economic performance in terms of economic growth and the optimal provision of public goods such as health, education and other public infrastructure. The optimal division of revenue raising and spending responsibilities between the federal government, State governments and other sub-national bodies like city and regional councils will be rigorously assessed from an economic perspective. The research will lead to recommendations regarding improvements in the structure of Australia's government sector, particularly the extent and nature of fiscal decentralisation, capable of improving productivity and future living standards.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878289 Dr MA Brown
Approved Project Title Investigating the role of gene loops in regulating gene expression
2008 : \$ 85,000
2009 : \$ 85,000
Primary RFCD 2702 GENETICS
Administering Organisation The University of Queensland

Project Summary

The ability to identify functional variants in regulatory elements will have implications for researchers in multiple fields of biology, from molecular medicine to agriculture. Transfer of expertise and application of the knowledge generated by our research to such fields stands to improve diagnosis of disease predisposition and to improve quality of animal and plant products. These outcomes will benefit all Australians. This knowledge will also improve the education of Australian University students as it contributes to the development of advanced curricula and access to more powerful research methods. In addition, the project will foster important collaborations between Australian researchers and those overseas.

DP0879194 Dr P Burn; Dr P Meredith
Approved Project Title Macromolecular Materials for Organic Solar Cells
2008 : \$ 160,000
2009 : \$ 150,000
2010 : \$ 145,000
2011 : \$ 145,000
Primary RFCD 2505 MACROMOLECULAR CHEMISTRY
Administering Organisation The University of Queensland

Project Summary

The world is in the midst of a climate crisis driven by mankind's insatiable demand for fossil-fuel energy. Renewable technologies such as solar and wind will undoubtedly form part of our future energy mix. Solar cells in particular have great potential- especially in sunny countries like Australia. The uptake of solar cell technology is hampered by their current high cost and long payback time. This project concerns the development of new solar cells based upon novel organic materials called dendrimers. These materials can be solution processed and will dramatically reduce cost and payback time in next generation devices.

DP0878922 Prof H Chanson
Approved Project Title Turbulence and energy dissipation in stepped spillways and urban drainage systems
2008 : \$ 120,000
2009 : \$ 90,000
2010 : \$ 75,000
Primary RFCD 2908 CIVIL ENGINEERING
Administering Organisation The University of Queensland

Project Summary

The economical sustainability of Australia's water resources relies upon an efficient use of its structures. Present water resources are diminishing because of poor engineering design. This issue is critical in both rural and urban Australia. The economical expansions of existing water supplies can be achieved by refurbishing reservoirs, water supply networks and urban water systems. The expertise derived from the project will spearhead applications in a range of industries dealing with civil and environmental systems.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878206 Prof SP Collin; Prof DM Hunt; Prof RG Foster; Prof IC Potter

Approved Project Title **Seeing without eyes: the evolution of non-visual photoreceptors in vertebrates**

2008 : \$ 90,000
2009 : \$ 90,000
2010 : \$ 65,000
2011 : \$ 100,000

Primary RFCD 2705 ZOOLOGY

Administering Organisation The University of Queensland

Project Summary

Australia's underwater biodiversity is second to none with endemic species representing the earliest stages in vertebrate evolution, many of them relying heavily on vision for survival. Tracing the evolution of light detection and image formation will provide crucial information about the lifestyles of our vertebrate ancestors, the environmental selection pressures driving speciation and colour communication. Characterisation of optimal light environments and extra-ocular light detection will also help protect and manage endemic species in wild and captive environments.

DP0880556 Dr DA Copland; A/Prof LA Nickels; Dr KL McMahon; Dr AJ Angwin

Approved Project Title **Neurocognitive substrates of naming facilitation in aphasia**

2008 : \$ 102,000
2009 : \$ 130,000
2010 : \$ 91,000

Primary RFCD 3210 CLINICAL SCIENCES

Administering Organisation The University of Queensland

Project Summary

This research directly addresses the national research priority goal of ageing well, ageing productively, by providing foundational knowledge for improved outcomes in the growing population of individuals in Australia with language impairments from age-related disease. Outcomes of the proposed research will include (1) development of a new theory of word production which can improve treatment of language impairment, (2) an enhanced understanding of the cognitive and brain mechanisms involved in word production and its treatment after stroke, and (3) postgraduate training in state-of-the-art cognitive neuroimaging and language neuroscience research.

DP0877160 Prof S Crozier; Prof LK Forbes; Prof RW Bowtell

Approved Project Title **High Field Magnetic Resonance Engineering**

2008 : \$ 328,368
2009 : \$ 320,000
2010 : \$ 300,000
2011 : \$ 300,000
2012 : \$ 200,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

APF Prof S Crozier

Administering Organisation The University of Queensland

Project Summary

The use of high resolution MRI is increasingly important in the quest for molecular imaging and the development of a range of gene therapies, stem cell research and the trialling of new drugs. This research will add momentum to Australia's health technology research community with positive impact on its international research and development profile. Successful outcomes will improve both the applicability and cost-effectiveness of numerous current and potential medical and non-medical imaging systems with subsequent potential for improved diagnosis in the biotech and health sectors in Australia and overseas. Successful outcomes will provide economic returns through licensing payments from the generated intellectual property.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0879250 Prof S Crozier; Dr SJ Wilson; Dr AP Bradley; Dr KE McMahon; Prof E Bengtsson; A/Prof I Nyström

Approved Project Title **Improved detection and characterisation of breast cancer using magnetic resonance imaging, and novel image analysis and pattern recognition techniques**

2008 : \$ 95,000
2009 : \$ 95,000
2010 : \$ 85,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Queensland

Project Summary

Breast cancer is a leading cause of death in Australian women. With no clear cause, one mainstay of management has been early detection. Newer medical imaging technologies such as magnetic resonance imaging require complex analysis to achieve their full benefit. Should the computationally demanding analyses of these images provide more sensitive and specific detection of early cancers, the potential reductions in morbidity and mortality from breast cancer will be of immense value. Successful implementation of the proposed project will further enhance Australia's position as a world leader in biomedical research and application of computational technologies to health problems.

DP0877155 Prof AK Dahle; Dr K Nogita; A/Prof CE Buckley; A/Prof EM Gray; Prof Dr Y Hatano

Approved Project Title **New Mg-based hydrogen storage material with destabilised hydrides**

2008 : \$ 230,000
2009 : \$ 270,000
2010 : \$ 240,000

Primary RFCD 2913 METALLURGY

Administering Organisation The University of Queensland

Project Summary

This project will develop a new magnesium-based hydrogen storage material for applications such as hydrogen-powered automobiles. Clean energy is a global challenge to reduce greenhouse emissions. Safe storage of hydrogen is a key barrier to the widespread implementation of hydrogen as a clean energy carrier. Magnesium is amongst the few materials able to meet the requirements for effective, safe, light-weight and cheap hydrogen storage. Light metals is a priority area for Australia with our large resources of aluminium and magnesium. Magnesium-based hydrogen storage could create a huge market for Australian magnesium and hydrogen storage systems.

DP0880105 Dr NL Daly; Mrs ST Henriques

Approved Project Title **Elucidating the chemical and biophysical basis for the bioactivity of cyclotides: ultra-stable proteins from plants**

2008 : \$ 105,000
2009 : \$ 104,000
2010 : \$ 99,000

Primary RFCD 2503 ORGANIC CHEMISTRY

APD Mrs ST Henriques

Administering Organisation The University of Queensland

Project Summary

The national/community benefits that are expected to arise from this research are economic and social in nature. In particular, this project has the potential to increase the national capacity for the development of peptides (mini-proteins) as anti-cancer drugs. With blockbuster protein-based drugs having sales in excess of \$10 billion per annum this proposal has the potential for very significant economic benefits for Australia. As well as these economic benefits a novel therapeutic agent for cancer would have enormous social benefits for Australia by decreasing the number of individuals affected and thereby reducing the subsequent emotional and physical distress associated with cancer.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0881116 Dr JJ De Voss; Mr PO de Montellano; Dr N Mitic

Approved Project Title **Understanding and Inhibiting the P450 CYP24 enzyme, a target for cancer chemotherapeutics.**

2008 : \$ 85,000

2009 : \$ 85,000

2010 : \$ 75,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Queensland

Project Summary

This project falls within the National Research Priority of Promoting and Maintaining Good Health in the category of ageing well and productively. CYP24 inhibition provides a particular target for breast and prostate cancer which are the second leading cause of death in women and men, respectively. The proposed research will result in the production of CYP24 inhibitors that will be assessed in vivo at the Hanson Institute in Adelaide as potential anti-cancer drugs. Finally, there is a significant benefit in technology transfer to Australia from our collaborators in the USA in the field of computer aided inhibitor design.

DP0878849 Dr JC Diniz da Costa; Dr S Liu; Prof JY Lin

Approved Project Title **Perovskite Asymmetric Hollow Fibres for Oxygen Separation in Clean Coal Energy Delivery**

2008 : \$ 180,000

2009 : \$ 170,000

2010 : \$ 140,000

2011 : \$ 150,000

2012 : \$ 130,000

Primary RFCD 2906 CHEMICAL ENGINEERING

ARF Dr S Liu

Administering Organisation The University of Queensland

Project Summary

The coal industry is one of the most important economic sectors in Australia, employing 30000 people, whilst black coal is Australia's largest export worth around \$24.5 billion. Energy security of supply is critical to Australia's social stability and economic growth, though Australia's reliance on coal for energy delivery is under strong scrutiny due to carbon mitigation. This project addresses the technology needs in tonnage oxygen separation towards a more efficient and cleaner means of generating energy. The project's benefits target at providing Australian consumers with affordable electricity in a decarbonised economy, enabling clean coal energy delivery to underpin the international competitiveness of the entire Australian economy.

DP0880404 Prof PD Drummond; Ms Q He; Dr JN Hedditch

Approved Project Title **Dynamics and correlations of many-body systems**

2008 : \$ 172,296

2009 : \$ 171,296

2010 : \$ 166,296

2011 : \$ 81,000

2012 : \$ 81,000

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

APD Ms Q He

APF Prof PD Drummond

Administering Organisation The University of Queensland

Project Summary

The proposed program will greatly enhance Australian science through linking innovative theoretical techniques with the successful ongoing Australian experimental program in atom lasers, atom chip interferometry and ultra-cold fermions. Pioneering theoretical methods in quantum phase-space are internationally recognized, and will be extended into new areas relevant to Australia. These have fundamental significance to fields ranging from nanotechnology to astrophysics, as well as providing a route to improved atomic clocks and other instruments. Combining these theoretical and computational methods from the physical sciences with biology and genetics will provide future cross-disciplinary benefits to Australian biomedical science.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0881485 A/Prof JA Fuerst; Prof Dr D Schueler

Approved Project Title **Nuclear structure and function in the nucleated planctomycete bacterium Gemmata obscuriglobus: a third cell plan for living organisms?**

2008 : \$ 85,000

2009 : \$ 85,000

2010 : \$ 85,000

Primary RFCD 2703 MICROBIOLOGY

Administering Organisation The University of Queensland

Project Summary

The project will contribute knowledge of how cells such as those of animals and plants evolved from bacterial components. Origins of cell nuclei and pores in nuclear membranes will be studied via the simple eukaryote-like nucleus of the planctomycete *Gemmata obscuriglobus*, from Australian freshwater. Simple nuclear pore-like structures of *G. obscuriglobus* will help understanding nucleus function in animal cells, and such pores will give insight into 'minimal' composition needed for cell nuclei, and allow design of biological nanopores. The origin of the nucleus is a major problem in biology, and an Australian contribution to its solution will achieve international recognition.

DP0877693 Dr C Gaus; Dr ME Bartkow; A/Prof F Wania

Approved Project Title **Atmospheric fate and processes of semi-volatile organic compounds in tropical climates**

2008 : \$ 75,000

2009 : \$ 74,000

2010 : \$ 69,000

Primary RFCD 2599 OTHER CHEMICAL SCIENCES

Administering Organisation The University of Queensland

Project Summary

The outcomes from this study will contribute fundamental and quantitative information for evaluation of the fate of semi-volatile organic compounds (SOCs) in tropical systems, including Australia's World Heritage ecosystems such as rainforest and the Great Barrier Reef. The study addresses key international knowledge gaps with respect to the influence of climate on SOC atmospheric fate. Australia's geographical location within the tropical belt provides an ideal opportunity for leading this field of research and contributes relevant data for its commitment under the Stockholm Convention.

DP0878589 Dr DR Geelan; Prof PG Mahaffy; Dr BE Martin

Approved Project Title **Evaluating the effectiveness of scientific visualisations in physics and chemistry education**

2008 : \$ 70,000

2009 : \$ 70,000

2010 : \$ 50,000

Primary RFCD 3302 CURRICULUM STUDIES

Administering Organisation The University of Queensland

Project Summary

Scientific visualisations are believed to have significant potential to improve students' learning of science concepts, potentially improving students' access to and outcomes in university science programs. This project will evaluate that potential to see whether it is realised in students' understanding of scientific concepts. The software, hardware, development and teaching skills required to use scientific visualisations in science teaching represent a significant investment of money and time on the part of the community. The results from this project will help in analysing the educational benefits of visualisations, providing important information for cost-benefit analyses.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0880204 Prof GC Gibson
Approved Project Title **Drosophila Quantitative Genomics**
2008 : \$ 208,100
2009 : \$ 212,384
2010 : \$ 199,070
2011 : \$ 198,100
2012 : \$ 198,100
Primary RFCD 2702 GENETICS
APF Prof GC Gibson
Administering Organisation The University of Queensland

Project Summary

This research proposal will be a key element in the emerging program in evolutionary and ecological functional genomics at the University of Queensland. Our studies utilize modern genomics approaches to address diverse national priorities from conservation of biological resources in the face of climate change, to understanding how genetic history contributes to drug susceptibility. The research will contribute to the intellectual foundation upon which rigorous environmental and biomedical research is built. Social impact will be seen in the training of a new generation of integrative genome biologists, and the shaping of attitudes toward the role of genetics in human biology.

DP0878448 A/Prof RM Gillies; Dr KC Nichols; Dr PA Cam; Dr G Burgh
Approved Project Title **Comparative effectiveness of two strategic and meta-cognitive questioning approaches on children's explanatory behaviour, problem-solving, and learning during cooperative, inquiry-based learning**
2008 : \$ 90,000
2009 : \$ 70,000
Primary RFCD 3301 EDUCATION STUDIES
Administering Organisation The University of Queensland

Project Summary

Teaching children to ask and answer questions is critically important if they are to engage effectively in reasoned argumentation, a cornerstone of inquiry-based learning. Unfortunately, in many schools, students are not consistently taught to pose and answer questions that challenge others' perspectives, understandings, and learning, nor are they taught to simultaneously monitor, regulate, and evaluate their own thinking and learning. This project builds on the benefits widely attributed to promoting higher-level thinking by helping teachers to enhance students' use of strategic and metacognitive questioning and the development of explanatory discourse during inquiry-based learning.

DP0878939 A/Prof GJ Goodhill; Dr GB Ericksson
Approved Project Title **A new theory for retinotectal map formation**
2008 : \$ 80,000
2009 : \$ 75,000
2010 : \$ 75,000
Primary RFCD 3207 NEUROSCIENCES
Administering Organisation The University of Queensland

Project Summary

How brains become wired up during development is a question of importance to both biology and computing. In this project we adopt a novel computational approach to understanding the development of topographic maps, a wiring pattern that is ubiquitous in biological nervous systems. This project will build capacity for research in computational neuroscience in Australia. It may also lead to technological benefits such as new ideas for the design of self-wiring computing devices, and new insights into the causes of wiring defects both during normal development and rewiring after injury.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0877147 A/Prof BD Hankamer; Dr O Kruse; Dr UC Marx

Approved Project Title Targeted bioengineering and systems biology for solar powered hydrogen production in green algal cells

2008 : \$ 102,000

2009 : \$ 92,000

2010 : \$ 92,000

Primary RFCD 2708 BIOTECHNOLOGY

Administering Organisation The University of Queensland

Project Summary

The development of clean fuels to combat climate change and protect against oil price shocks, is an urgent challenge facing our society. Fuels make up ~67% of the energy market, yet most low-CO2 emissions technologies (e.g. nuclear and clean-coal-technology) target the electricity market. In contrast the Solar Bio-H2 process uses algal photobioreactors to drive solar-powered H2 fuel production from water (ultimately sea water, facilitating desalination). This project aims to improve the efficiency of the process towards economical levels. The Solar Bio-H2 process reduces water requirements for biofuel production. Locating bioreactors on non-arable land also eliminates competition between biofuel and food production.

DP0879667 Prof PC Hayes; A/Prof E Jak

Approved Project Title ECOLOGICALLY SAFE RECYCLING OF ELECTRONIC SCRAP - CHEMICAL THERMODYNAMICS OF NOVEL HIGH TEMPERATURE PROCESSING TECHNOLOGY

2008 : \$ 130,000

2009 : \$ 120,000

2010 : \$ 120,000

Primary RFCD 2913 METALLURGY

Administering Organisation The University of Queensland

Project Summary

As a developed industrialized society we are faced with increasing problems associated with the obsolete electronic materials. These materials are classed as hazardous wastes because they contain heavy metals and other elements that must be removed or made chemically inert before they can be disposed of safely. Electronic components however also represent a source of valuable elements that can be recovered and reused. The project will assist in finding safe, cost-efficient ways in which we can process these materials and, at the same time, recover the valuable metals contained within them. The project will thus contribute to the sustainable use of our raw materials and a cleaner environment.

DP0878877 Dr MA Haynes; Dr P Chhetri; Prof PR Boreham

Approved Project Title Understanding the Spatial and Social Drivers of Employment Transitions

2008 : \$ 85,000

2009 : \$ 80,000

2010 : \$ 80,000

Primary RFCD 3701 SOCIOLOGY

Administering Organisation The University of Queensland

Project Summary

This project reconsiders significant changes in the Australian labour market by utilising new conceptual tools based on temporal and spatial dimensions of productive activities and employment. The analysis provides an understanding of the socio-economic and spatial drivers of job and employment transitions and how they vary across Australia. The outcomes will be a new hierarchical model of labour market regions for assessing the social impact of employment transitions in regions, localities and remote areas providing evidence to inform region-specific policy. The innovative statistical methodology to enhance current analytical models of spatial variation in employment transitions will contribute significantly to international research.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0879604 Prof MP Jennings

Approved Project Title **Phasevarions of Haemophilus influenzae: mechanisms and origins of a novel epigenetic system controlling coordinated random switching in expression of multiple genes**

2008 : \$ 207,248
2009 : \$ 190,349
2010 : \$ 179,571

Primary RFCD 2702 GENETICS

Administering Organisation The University of Queensland

Project Summary

Central to the utilisation of biological information is our ability to identify and interpret DNA sequence information from genomes. In bacteria that cause disease, these investigations can identify key aspects of the infectious process or potential components of vaccines or new targets for antibiotics. Our recent work has identified a new genetic system, the 'phasevarion', that mediates random expression of multiple genes. The proposed research aims to advance our understanding of gene expression at the most basic level, revealing how bacteria generate diverse populations to evade environmental and immune stresses, and facilitating improved interpretation and use of DNA sequences for researchers and industry in this field.

DP0878598 Dr TM Johnson-Woods

Approved Project Title **Australia's Forgotten Culture: the Pulp Fiction Industry 1939-1959**

2008 : \$ 73,887
2009 : \$ 73,722
2010 : \$ 54,857

Primary RFCD 4202 LITERATURE STUDIES

Administering Organisation The University of Queensland

Project Summary

Australia's Forgotten Culture systematically examines the Australian 'pulp' industry (1939-1959). In 1939 imported American cultural products were banned; this ban created a vacuum in the Australian market. Sydney publishers filled the gap with paperback books written by Australians for Australians. These books sold millions of copies and inspired a plethora of cultural products such as radio serials and comics; they were also successfully exported overseas. Carter Brown alone sold over 80 million books in dozens of languages. In 1959, the bans were lifted. Overnight the industries died. This project analyses a rich but lost period in Australian culture, one that has been ignored presumably because it was popular.

DP0878525 Dr U Kappler

Approved Project Title **Sulfur cycling in soil environments - how bacteria contribute to the oxidation of organic and inorganic sulfur compounds**

2008 : \$ 90,000
2009 : \$ 90,000
2010 : \$ 90,000
2011 : \$ 90,000
2012 : \$ 90,000

Primary RFCD 2703 MICROBIOLOGY

ARF Dr U Kappler

Administering Organisation The University of Queensland

Project Summary

Element cycling in soil environments is of global significance as soils constantly exchange compounds with the atmosphere and cover vast areas of land. Many of the compounds exchanged are known contributors to the greenhouse effect and other phenomena such as acid rain. By elucidating the regulation of bacterial sulfur oxidation pathways and their integration into general metabolism, we will enable the development of better management strategies for agricultural soils. Our data will also significantly improve understanding of how soil processes will change in response to changing climatic conditions.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878450 Prof GF King; Prof PF Alewood; Dr N Audsley

Approved Project Title **Orally active spider toxins: a novel paradigm for control of insect pests**

2008 : \$ 185,000

2009 : \$ 185,000

2010 : \$ 175,000

Primary RFCD 2505 MACROMOLECULAR CHEMISTRY

Administering Organisation The University of Queensland

Project Summary

Many insects and other arthropods are serious pests of Australian crops, livestock, and pets. Australian farmers spend about \$300 million per annum on insecticides and acaricides, while Australian consumers spend more than \$100 million annually on insecticides for use around the home and garden, and on pets. Viruses disseminated by arthropods are also responsible for diseases such as dengue, Japanese encephalitis, and Ross River fever.

Unfortunately, many of these arthropod pests have developed resistance to chemical insecticides. This aim of this research program is to develop a new generation of environmentally-friendly natural products that can be used to control arthropod pests on pets, farms, and around the home and garden.

DP0879780 Dr B Launikonis

Approved Project Title **Calcium regulation in the skeletal muscle triad and along the fibre.**

2008 : \$ 80,140

2009 : \$ 85,140

Primary RFCD 2706 PHYSIOLOGY

Administering Organisation The University of Queensland

Project Summary

The fundamental role of skeletal muscle is posture and movement. Alterations in the normal way calcium regulates skeletal muscle function in fatigue, age and disease states causes loss of normal function. Preventing or controlling these changes is a key therapeutic aim. However, we currently lack full understanding of key mechanisms of calcium regulation in healthy skeletal muscle. This project will define key aspects of calcium regulation that could be crucial to developing targets for improving function of skeletal muscle under stressed states.

DP0877146 Dr WR Louis; Dr JR Smith; Prof DJ Terry

Approved Project Title **What makes unwritten rules work? A framework for understanding normative influence.**

2008 : \$ 50,000

2009 : \$ 45,000

2010 : \$ 65,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Queensland

Project Summary

Societies are regulated primarily by norms, which are unwritten, informal rules for appropriate behaviour. Governments, religious and cultural groups, and even families can all actively campaign to change people's standards or norms for behaviour. However, often people ignore the normative messages. As one example, child obesity rates in Australia continue to grow, despite years of campaigns on this issue. Sometimes normative campaigns can even increase the problems they're trying to solve. For example, some research shows children targeted with anti-drug messages are more likely to abuse drugs. This research tests why normative campaigns fail, and how to solve the problem.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0879769 Prof GM Lu; Prof PF Bartlett; Dr Z Xu; A/Prof HM Cooper; Prof D Zhao

Approved Project Title **Novel Hybrid Inorganic Nanoparticles for Effective siRNA Delivery to Neurons**

2008 : \$ 320,000
2009 : \$ 320,000
2010 : \$ 230,000
2011 : \$ 230,000
2012 : \$ 230,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

ARF Dr Z Xu

Administering Organisation The University of Queensland

Project Summary

This project will lead to a more efficient and reliable drug delivery system to treat Huntington's disease. The insights and technology gained from this project will be directly applicable for many human diseases, both within and outside the central nervous system. This project will make a major contribution to the ARC's goal of maintaining good health and promises to significantly reduce the financial and psychological burdens to patients' family and community. This project will encourage inter-disciplinary approaches to research and train highly skilled researchers both in neuroscience and nanobiotechnology to advance Australia's industrial competitiveness.

DP0878608 Prof AE Mark; Dr BM Collins; Prof WF van Gunsteren; Prof S Marrink

Approved Project Title **From structures to systems: A hierarchical approach to understanding sub-cellular components.**

2008 : \$ 135,000
2009 : \$ 134,000
2010 : \$ 129,000

Primary RFCD 2499 OTHER PHYSICAL SCIENCES

Administering Organisation The University of Queensland

Project Summary

This program will dramatically extend the range of biomolecular systems that can be modelled with near atomistic precision. It will provide a better understanding of the structure and function of proteins involved in the regulation of membrane fusion and fission as well as shedding light on the assembly of large-scale protein-protein and protein-membrane complexes in general. The work will help place Australia at the forefront of developing simulation techniques in biomolecular systems, which are widely used within the chemical and pharmaceutical industries for modelling processes ranging from protein-drug interactions to the phase behaviour of lipids and surfactants.

DP0877875 Prof RH McKenzie; Dr TM Stace; Prof DL Cox

Approved Project Title **Modelling quantum dynamics of electronic excited states in complex molecular materials**

2008 : \$ 178,000
2009 : \$ 184,000
2010 : \$ 181,000
2011 : \$ 183,000
2012 : \$ 100,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

APF Prof RH McKenzie

Administering Organisation The University of Queensland

Project Summary

Understanding new materials that are the basis of new sources of renewable energy sources represents a major scientific challenge. Many of these materials are composed of large organic molecules containing hundreds of atoms. Their properties and the concepts needed to understand these materials are distinctly different from semiconductors such as silicon. This research will enhance our ability to design better materials and optimize the performance of organic solar cells and LEDs. Australia's capacity for research and development in this scientifically challenging and technologically important field will be enhanced by this project.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0879814 Prof GJ McLachlan; Dr SK Ng

Approved Project Title **Mixture models for high-dimensional clustering with applications to tumour classification, network intrusion, and text classification**

2008 : \$ 75,000

2009 : \$ 75,000

2010 : \$ 70,000

Primary RFCD 2302 STATISTICS

Administering Organisation The University of Queensland

Project Summary

This project will benefit the Australian Society as a whole by developing statistical methodology for the clustering of high-dimensional data. In particular, it will develop a novel and efficient model for extracting useful information from subpopulations. It thus has wide applicability to improving the quality and validity of applied research in most industries in Australia. More specifically, it is to be applied here to classify brain tumours and detect network intruders. This cross-disciplinary project will contribute to Australia's economic of public health, protect Australia from crime, and strength Australian researchers' capacity and capability of participating in this emerging science.

DP0877161 A/Prof PC Memmott; Dr S Schmidt; A/Prof RA Hyde; Dr DJ Martin; Dr RJ Fensham

Approved Project Title **Towards Novel Biomimetic Building Materials: Evaluating Aboriginal and Western Scientific Knowledge of Spinifex Grasses**

2008 : \$ 175,000

2009 : \$ 155,000

2010 : \$ 200,000

2011 : \$ 160,000

2012 : \$ 80,000

Primary RFCD 3703 ANTHROPOLOGY

Administering Organisation The University of Queensland

Project Summary

The project contributes to an environmentally sustainable Australia by examining the potential value of a hitherto ignored natural resource and assessing its usage with sustainable harvesting. Aboriginal knowledge and Western science will be combined to identify potential technological applications for a widespread but uniquely Australian resource. The project promotes the well-being and health of Aboriginal people through seeking out a new economic enterprise for remote area groups. This project examines the material properties of spinifex, specifically for new building industry applications, both in its natural state and replicated as a synthesized biomimetic material.

DP0879944 Dr P Meredith; Prof AG White; Asst Prof F Rosei; Prof E Kaxiras

Approved Project Title **Biomolecular optoelectronic materials and devices**

2008 : \$ 145,000

2009 : \$ 140,000

2010 : \$ 135,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Organisation The University of Queensland

Project Summary

The melanins are the molecules in our skin, eyes and hair that provide colour and protection from the sun. In addition to being important bio-molecules, they have properties which make them useful for high tech applications especially in electronics and optoelectronics. Unfortunately, our current understanding of these fascinating materials is poor. In our project we aim to solve this limiting problem. We will develop new science to explain their behaviour, and use this knowledge to create bio-compatible hi-tech materials and devices. We anticipate significant benefits from the perspectives of basic science and utilisation of biomaterials for new green technologies.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0881351 Dr DJ Merritt

Approved Project Title **A shared genetic basis for development of the nervous system and glands**

2008 : \$ 65,000

2009 : \$ 65,000

2010 : \$ 65,000

Primary RFCD 2702 GENETICS

Administering Organisation The University of Queensland

Project Summary

Fruit flies possess strikingly similar versions of the genes that promote normal human development. The list of systems with genetic parallels between humans and fruit flies includes the respiratory and circulatory systems; cardiovascular development and disease; sleep; learning and memory; brain development and disease; taste, sight, smell and hearing. This project could add at least some human glands, the mucous-secreting goblet cells, to this list, providing a potentially useful model for studying human diseases associated with gland dysfunction.

DP0878029 Prof J Moorhead

Approved Project Title **The Papacy in Late Antiquity**

2008 : \$ 51,657

2009 : \$ 56,657

2010 : \$ 37,328

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Queensland

Project Summary

The papacy, one of the oldest and most powerful institutions in the world, has recently been revitalized and gives every sign of retaining its authority in the immediate future. The research aims to explain how, across some three hundred years, it came to enjoy its position. In a world in which religious authority and allegiance is becoming more important, locally and internationally, a sound understanding of the foundations of a key institution will be of great benefit.

DP0879133 Dr JS Mylne

Approved Project Title **Circular Plant Proteins with Pharmaceutical Applications**

2008 : \$ 150,000

2009 : \$ 147,877

2010 : \$ 137,877

2011 : \$ 137,877

2012 : \$ 137,877

Primary RFCD 2704 BOTANY

QEII Dr JS Mylne

Administering Organisation The University of Queensland

Project Summary

The proposed research will develop methods for using plants as protein production factories. Initially I will use plants to create engineered cyclotides that incorporate peptides with proven therapeutic activity against cancer and multiple sclerosis. Successful production of therapeutic proteins in plants will benefit Australians by making treatments for these and other diseases more accessible. It also has the potential for a major economic benefit from the sales of Australian-based drugs. This proposal will also provide outstanding research training for graduate students in multidisciplinary methods that constitute state-of-the-art structural and plant molecular biology.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878673 Dr AF Neal; Dr GB Yeo; Dr PJ Kwantes

Approved Project Title **Developing and testing a dynamic model of the proximal and distal motivational processes responsible for the regulation of task-directed effort.**

2008 : \$ 148,000

2009 : \$ 104,000

2010 : \$ 84,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Queensland

Project Summary

The project will provide benefits for society, both in terms of its contribution to scientific knowledge and understanding, and potential applications for end users. The question of how people prioritise tasks, set goals, and apply effort is of fundamental importance for understanding human behaviour. Society benefits from basic research into this question, because it allows us to understand the sources of (and limits to) human resilience. The results have wide application in military, industrial and commercial settings. Examples include the development of tools for training people more effectively, managing their workload, and improving their performance.

DP0877836 A/Prof CJ O'Donnell; Prof JC Quiggin; Dr RG Chambers

Approved Project Title **State-contingent analysis of productivity, efficiency and innovation.**

2008 : \$ 142,859

2009 : \$ 147,370

2010 : \$ 147,370

Primary RFCD 3401 ECONOMIC THEORY

Administering Organisation The University of Queensland

Project Summary

Productivity growth is a fundamental precondition for sustainable improvements in living standards. The main drivers of productivity growth are technological innovation and improvements in the efficiency of resource use. Effective public policy in this area requires identification of these components. This project develops improved productivity measurement methods that are applicable in economic environments characterised by production and/or demand uncertainty. The methods will be used to obtain improved estimates of rates of innovation and changes in the relative efficiency of selected Australian enterprises. The empirical results will inform National Competition Policy and the process of microeconomic reform.

DP0879595 A/Prof KI Pakenham

Approved Project Title **Young Carers: Investigation of the Psychosocial Impact of Caregiving on Youth Who Have a Parent with an Illness or Disability**

2008 : \$ 88,416

2009 : \$ 57,218

2010 : \$ 72,575

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Queensland

Project Summary

This project addresses a growing national public health concern; the welfare of youth affected by parental illness/disability. There is a projected increase in reliance on unpaid care, and young carers are an important but hidden and neglected carer group. Although young carers have recently emerged on the political agenda, the research in this field is at an early descriptive stage resulting in a lack of empirical data to inform policy and service development. There is a critical need for data that elucidates young caregiving in Australia. This project will establish new methodologies and frameworks and provide data that will inform policy and services that promote the healthy development of youth affected by parental illness/disability.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0880571 Prof P Poronnik; Prof S Kumar

Approved Project Title **Assessing the physiological roles of ubiquitination in regulating neuronal ion channels, receptors and transporters**

2008 : \$ 180,000

2009 : \$ 180,000

2010 : \$ 180,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Queensland

Project Summary

Significant alterations in the activity neuronal transporters and receptors occur during tissue injury and regeneration as well as in many neurodegenerative disease states. Modulation of the pathways that control these transporters is an emerging therapeutic target, however, the molecular basis of these control mechanisms remain poorly understood. The outcome of this project will be a thorough characterisation of a novel regulatory paradigm in neurons that is likely to be crucial for neuronal development and regeneration, and will potentially provide novel therapeutic targets for various neuronal diseases.

DP0878523 Dr BJ Powell; Dr MR Pederson; Prof SJ Blundell

Approved Project Title **Strongly correlated electron models for organic superconductors**

2008 : \$ 126,000

2009 : \$ 126,000

2010 : \$ 126,000

2011 : \$ 126,000

2012 : \$ 120,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

QEII Dr BJ Powell

Administering Organisation The University of Queensland

Project Summary

In conventional metals such as copper the interactions between the electrons do not qualitatively change the behaviour of the material. However, over the last few decades many materials have been discovered whose behaviours are dominated by the interactions between electrons. These 'strongly correlated' materials include technologically important materials used in power distribution, catalysis and plastic display technologies. This project will combine theoretical and experimental methods from chemistry and physics in an effort to explain the novel behaviours seen in certain classes of organic strongly correlated materials. This understanding has the potential to impact future electronic devices and advanced materials.

DP0881279 Dr GJ Price

Approved Project Title **Constructing a temporally-constrained palaeoecological model of Quaternary faunal evolution and extinction in eastern Australia**

2008 : \$ 100,000

2009 : \$ 100,000

2010 : \$ 100,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APD Dr GJ Price

Administering Organisation The University of Queensland

Project Summary

Increased climatic variability and human-induced environmental degradation have had severe impacts on biodiversity, socio-economic sustainability and possibly our own future survival, thus attracting global attention. This study will help unravel the causes of the extinctions of Australia's large-size animals (megafauna) during the periods of last glaciation and earliest human colonisation of Australia. Investigating the causes of megafauna extinction is essential for an understanding of how those prehistoric events shaped the modern biota, and for the development of conservation strategies for our endemic faunas in an era of increased climatic and environmental variability and vulnerability.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0879245 Dr K Rabaey; Dr PL Bond; Prof KH Neilson; Prof N Boon; Dr FB Pichler

Approved Project Title **EXTRACELLULAR ELECTRON TRANSFER IN BIO-ELECTROCHEMICAL SYSTEMS**

2008 : \$ 80,000

2009 : \$ 125,000

2010 : \$ 140,000

2011 : \$ 140,000

Primary RFCD 2703 MICROBIOLOGY

APD Dr K Rabaey

Administering Organisation The University of Queensland

Project Summary

Water quality and supply are critical issues in Australia. This project investigates the role of bacteria in maintaining a good freshwater quality, and the influence of environmental parameters on this. It will enable us to assess the role of bacteria on greenhouse gas emissions in a variety of environments. As a result, processes can be developed to alleviate high emissions while simultaneously producing green energy. The proteomics study will deliver, aside from knowledge, redox proteins which find their way to diagnostics and fuel cells. This project substantiates Australia based research at the forefront and enables international anchoring of our expertise.

DP0877314 Dr AE Rafferty

Approved Project Title **Developing employee well-being and performance through transformational leadership**

2008 : \$ 66,335

2009 : \$ 40,000

2010 : \$ 41,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Queensland

Project Summary

This proposal contributes to the ARC priority area of strengthening Australia's social and economic fabric. A key national benefit of this research is increasing understanding of how specific leadership behaviours improve employees' well-being and performance. This research also identifies which followers are most responsive to leadership and in what contexts these behaviours are most effective. This information is critical as it enables development of selection and training packages specifically designed to provide leaders with the skills needed to build employee well-being and performance.

DP0879365 Dr AJ Richardson; Dr AJ Hobday; Dr TA Okey; Dr RJ Matear

Approved Project Title **Integrating climate and ecosystem models to predict climate change impacts on Australian marine systems**

2008 : \$ 98,650

2009 : \$ 98,650

2010 : \$ 88,000

Primary RFCD 3007 FISHERIES SCIENCES

Administering Organisation The University of Queensland

Project Summary

This project will underpin Australia's commitment to maintain environmental sustainability and biodiversity in the face of climate change. We will describe the consequences of climate change on harvested marine resources, biodiversity, ecosystem structure and function, and sensitive species and habitats. We will provide practical management solutions to maintain ecosystem integrity and enhance resilience under a changing climate. This information is of immediate use by a range of Australian stakeholders including national, state and local government agencies and authorities. The project will put Australian scientists at the forefront of research focused on adapting to marine climate impacts.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878306 Dr C Riginos; Prof HP Possingham

Approved Project Title **Coral reef connectivity: an empirical and theoretical synthesis**

2008 : \$ 177,580
2009 : \$ 179,982
2010 : \$ 116,078

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

Administering Organisation The University of Queensland

Project Summary

Australia possesses the greatest marine biodiversity of any first world country and this biodiversity is a major contributor to our economic wealth. Nonetheless, Australia's coral reef communities are threatened by various human activities and climate change. Wisely designed systems of marine reserves are critical to mitigating threats to coral reefs, but existing approaches do not incorporate crucial information about ecological connections between reefs. We will use graph theory metrics to identify priority reefs for protection based on empirical genetic and hydrological connectivity information. In addition, we will determine the sensitivity of these priorities to climate change scenarios.

DP0878007 Prof P Sah

Approved Project Title **Mechanisms of fear learning and extinction in the mammalian brain**

2008 : \$ 167,750
2009 : \$ 161,000
2010 : \$ 151,000
2011 : \$ 151,000
2012 : \$ 151,000

Primary RFCD 3207 NEUROSCIENCES

APF Prof P Sah

Administering Organisation The University of Queensland

Project Summary

The brain is a remarkable machine that coordinates all aspects of our daily lives including the storage and retrieval of memories. Given that many age-related degenerative disorders are associated with marked changes in learning and memory it also has implications for Australia's National Research Priority 2 "Ageing well and ageing productively". This research aims to discover the basic mechanisms that underlie memory storage and how these are modulated in an emotional context. It will also shed light on states such as anxiety, depression and post-traumatic stress, enhancing our ability to identify new therapeutic targets for such disorders.

DP0880920 Prof PM Sanderson; Prof B Venkatesh

Approved Project Title **Coordination and communication in critical care: Assessing potential technology support**

2008 : \$ 101,000
2009 : \$ 80,000
2010 : \$ 78,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Organisation The University of Queensland

Project Summary

This project will examine temporal coordination demands of busy critical care environments, with the goal of developing better models and tools for evaluating the impact of information and communication technology (ICT) innovation. Millions of dollars can be wasted on healthcare ICT updates when the nature of critical care work, the means of communication, and temporal coordination demands are not fully understood. The outcome of this project will be better conceptual and computational tools for assessing the impact of ICT innovation on safety-critical systems such as healthcare, so providing more cost-effective ICT solutions where there is rapidly-evolving ICT innovation.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878781 Dr Z Skrbis; Prof MC Western

Approved Project Title **Social Futures and Life Pathways of Young People in Queensland: Waves 2 and 3 of Longitudinal Study**

2008 : \$ 140,000

2009 : \$ 100,000

2010 : \$ 130,000

2011 : \$ 60,000

Primary RFCD 3701 SOCIOLOGY

Administering Organisation The University of Queensland

Project Summary

Much has been written about the unprecedented change in society and how it impacts on the identities of young people. It has been argued that young people's life trajectories are much more diverse, flexible and unpredictable than they were in the past. In 2006 the investigators surveyed over 6000 young Queenslanders aged 13 about what they think of their future and how they cope with change. This project follows-up participants when they are 15 and 17 to provide important information for researchers, policymakers and others about how young people think about their futures, engage with society, and move through school, work and family in a world of rapid change and uncertainty.

DP0879819 Prof RJ Stimson; Prof RR Stough; Mr P Aroca

Approved Project Title **Conceptualizing and Measuring Regional Endogenous Growth: A Collaborative International Comparative Investigation**

2008 : \$ 33,286

2009 : \$ 27,660

2010 : \$ 28,150

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The University of Queensland

Project Summary

Policy for regional economic development in Australia is placing more emphasis on facilitating regional self-help. For the first time this project will provide an actual measure of regional endogenous performance. It identifies those features of regional economies and local populations are most important in explaining differences in the performance of regions, and it shows how institutional arrangements and leadership can enhance or detract from regional development performance. This will help public agencies formulate better policies and mechanisms to help regions maximise their capacities to achieve enhanced endogenous growth. International comparative studies provide wider significance for policy formulation in regional development.

DP0880032 Dr KJ Thurecht; Prof SM Howdle

Approved Project Title **Supercritical CO₂: A Clean, Green Reaction Medium for Novel Polymer Synthesis and Modification**

2008 : \$ 95,000

2009 : \$ 95,000

2010 : \$ 95,000

Primary RFCD 2914 MATERIALS ENGINEERING

APD Dr KJ Thurecht

Administering Organisation The University of Queensland

Project Summary

This project will lead to the development of new macromolecular structures with application in many areas ranging from drug delivery to the microelectronics industry. More importantly, the processes used to manufacture these products will utilise supercritical CO₂ - a clean, green processing technology that can totally remove the need for using environmentally-degrading, volatile organic solvents. The unique properties of scCO₂ will be used to develop new polymer materials and processes. This technology will promote Australia's commitment towards greener industrial alternatives, while simultaneously strengthening our science and opening up new possibilities in the rapidly advancing area of nano-technology.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878502 Prof RI Tinning; Dr AJ Rossi; Prof D MacDonald

Approved Project Title **Teachers' professional development, communities of practice, and the secondary school subject department: The case of health and physical education.**

2008 : \$ 55,000
2009 : \$ 60,000
2010 : \$ 56,000

Primary RFCD 3303 PROFESSIONAL DEVELOPMENT OF TEACHERS

Administering Organisation The University of Queensland

Project Summary

Schools are significant sites of authentic learning for teacher professional development. This study will contribute to a better understanding of how the culture of the secondary school subject department can facilitate or hinder such development. The project will: contribute to creating more supportive work contexts for teachers thereby reducing teacher attrition; inform the development of better policies and practices surrounding teachers' professional learning communities; contribute to national and state level initiatives for the articulation of professional standards for teaching; and optimise the professional practices of HPE teachers who, as 'allied health workers', are integral to addressing Australia's health priorities.

DP0877316 A/Prof JE Tompkins

Approved Project Title **The Local Spaces of Contemporary Brisbane Theatre: A Strategy for Analysing and Interpreting Theatre**

2008 : \$ 50,000
2009 : \$ 50,000
2010 : \$ 35,000

Primary RFCD 4101 PERFORMING ARTS

Administering Organisation The University of Queensland

Project Summary

This study of three Brisbane theatres benefits Brisbane's theatre community, as well as national and international communities: the project uses innovative theoretical approaches and virtual reality technology to analyse theatre productions. Its merging of different perspectives on how theatre is produced and how it may be better researched is relevant to theatre analysis everywhere. The project also connects theatre with its broader cultural context by concentrating on Brisbane's notable staging of 'local' matters. While the local is often overshadowed by the 'national,' in Brisbane, the local provides the main link between aesthetics and the cultural contextualising of theatre.

DP0878733 Prof I Toth; Prof RF Minchin; Dr MR Whittaker

Approved Project Title **Synthesis, Biological Interactions and Toxicity Studies of Precisely Engineered Nanoparticles**

2008 : \$ 150,000
2009 : \$ 150,000
2010 : \$ 175,000

Primary RFCD 3205 PHARMACOLOGY AND PHARMACEUTICAL SCIENCES

Administering Organisation The University of Queensland

Project Summary

The proposed benefits of nanotechnology for industries from material sciences, to bioengineering, energy and the environment are currently driving unprecedented growth in this technology world-wide. Some of these benefits are borne out of the unique properties that different nanoparticles exhibit. However, if nanomaterials pose a threat to the health and well-being of the community, then their risks may outweigh their benefits. This project will identify those characteristics of nanoparticles that can lead to adverse effects and therefore pose a danger to the general community. By defining these characteristics, appropriate changes in nanomaterial production can be considered by industry to minimise these dangers.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878830 Prof G Vidal; Dr R Orus; Dr JO Fjaerestad; Dr F Verstraete
Approved Project Title **Novel approaches to strongly correlated quantum systems in two dimensions**
2008 : \$ 200,000
2009 : \$ 190,000
2010 : \$ 185,000
Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS
APD Dr R Orus
Administering Organisation The University of Queensland

Project Summary

The expected outcome of the research program is a significant boost in our understanding of strongly correlated quantum systems, which will reinforce Australia's competitiveness and international profile in aspects of breakthrough science and frontier technologies. By strengthening both the underpinning theory and innovative computational tools to study quantum many-body systems, and by applying them to specific problems of recognized importance, this program will have direct implications in condensed matter physics and will exert significant influence in areas such as quantum chemistry, high energy physics, quantum computing, quantum atom optics and nanotechnology.

DP0879605 Dr CR White; Prof RS Seymour; Mr PG Matthews; Prof KA Christian; Dr SI Runciman; Prof TM Blackburn
Approved Project Title **The evolution of periodic ventilation in insects**
2008 : \$ 200,000
2009 : \$ 100,000
2010 : \$ 100,000
Primary RFCD 2705 ZOOLOGY
APD Mr PG Matthews
Administering Organisation The University of Queensland

Project Summary

The primary outcome of this research initiative is a new approach to the understanding of the evolution of periodic ventilation in insects. It involves researchers from four Australian universities, and will showcase the strength of Australian research and the diversity of the Australian insect fauna, and demonstrate the utility of the Australian environment as a model system for the study of fundamental biological problems. The research deals with the influence of microclimate on the physiology of insects. This will lead to an appreciation of the ability of these species to respond to climate change.

DP0879913 Dr D Wilhelm
Approved Project Title **A new paradigm of gene regulation - implications in embryogenesis and disease**
2008 : \$ 109,978
2009 : \$ 109,978
2010 : \$ 109,978
Primary RFCD 2702 GENETICS
Administering Organisation The University of Queensland

Project Summary

The proposed analysis of a new paradigm of gene regulation will provide a new key to understanding genome function and inform some of the most compelling biological issues of our time such as stem cell biology, tissue and organ regeneration and genetic programming. The insights and technologies developed in this program will be widely applicable in biotechnological and pharmacogenomic research in Australia and worldwide, and assert Australia's leadership in this area of research.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0880023 Dr KA Wilson

Approved Project Title **Maximising the conservation of biodiversity and the delivery of ecosystem services: What to do, where and when**

2008 : \$ 128,648
2009 : \$ 126,648
2010 : \$ 124,148

Primary RFCD 3008 ENVIRONMENTAL SCIENCES

APD Dr KA Wilson

Administering Organisation The University of Queensland

Project Summary

The economic wealth of Australia is underpinned by its remarkable biological diversity. However, land and water degradation are eroding Australia's natural asset base damaging industries such as tourism, fisheries, and forestry. Given limited funds for biodiversity conservation, we need to minimise the misallocation of resources by making wise investments. This research will result in frameworks and tools to ensure that we maximise the protection of biological diversity and the delivery of ecosystem services (such as clean water) that are important for human well-being. We will share the results of our research with decision makers, scientists, and the general public.

DP0877848 Dr TM Woodruff

Approved Project Title **Role of the complement system in the healthy and diseased central nervous system**

2008 : \$ 80,000
2009 : \$ 80,000
2010 : \$ 80,000

Primary RFCD 3207 NEUROSCIENCES

APD Dr TM Woodruff

Administering Organisation The University of Queensland

Project Summary

The investigation into the role of the immune system in the central nervous system will increase our understanding of the causes behind the neurodegenerative process in aging individuals. This research will also indicate the potential for new types of anti-inflammatory drugs, to be used to slow the neurodegenerative process occurring naturally in the aging brain. These drugs could also be useful in treating drastic neurodegenerative diseases such as motor neuron disease, Huntington's disease and Parkinson's disease. Of these, only Parkinson's disease currently has some effective treatments. Community and National benefits would be increased health, decreased stress and major economic savings.

DP0879906 A/Prof PR Young; Dr J Meers

Approved Project Title **Retroviral invasion of the koala genome: Where did it come from and what is it doing now that its there?**

2008 : \$ 90,000
2009 : \$ 90,000
2010 : \$ 75,000

Primary RFCD 3005 VETERINARY SCIENCES

Administering Organisation The University of Queensland

Project Summary

Although some populations of free-ranging koalas are flourishing, many are in decline as a result of habitat loss and disease. We have shown that a recently identified virus that has infected koalas throughout most mainland Australian populations is associated with high rates of cancer in these animals. This project will study the growth properties of this virus and the mechanism by which it causes cancer in order to provide a foundation for developing intervention strategies for protection of this iconic Australian species.

Summary of Discovery Projects Proposals for Funding to Commence in 2008

DP0878752 Prof J Zhang; Dr KK Tang

Approved Project Title **Lifelong Education and Health Investment: Implications for Life Expectancy, Economic Growth and Public Policy**

2008 : \$ 79,215

2009 : \$ 77,177

2010 : \$ 78,880

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The University of Queensland

Project Summary

This project will provide Australian policymakers a clear picture of the complex interaction between various policy instruments including subsidies on health and education and income support for retirees and children on the one hand, and socioeconomic outcomes including saving rates, labour participation, productivity, fertility, life expectancy and inequality on the other hand. This knowledge can be used to frame government policies in the areas of health, education, superannuation and pension, and family support. In particular, the project will inform policymakers about the mix of private and public funding of the health system that can produce better health and social outcomes.

DP0879584 Dr J Zhu; Prof V Rudolph; Prof M Zhao

Approved Project Title **Development of Superflux Carbon Nanotube Membranes for Gas Separation**

2008 : \$ 160,000

2009 : \$ 165,000

2010 : \$ 180,000

2011 : \$ 150,000

2012 : \$ 100,000

Primary RFCD 2906 CHEMICAL ENGINEERING

QEII Dr J Zhu

Administering Organisation The University of Queensland

Project Summary

The project seeks to develop gas separation membranes displaying superfluxes - throughputs 10 to 100 times higher than current systems, with lower operating costs. There is compelling evidence that very high flow rates are achievable and they have been shown for single gas transport. Theory predicts that highly selective separations are possible, but this has not yet been experimentally shown - a key outcome from this project. The applications are widespread and include separation of carbon dioxide from power station flue gas for sequestration, purification of natural gas and provision of pure component gases such as oxygen and nitrogen amongst others.