

Summary of Discovery Projects Proposals for Funding to Commence in 2007

Western Australia

The University of Western Australia

DP0770050 Dr BC Baer

Approved Project Title **Sex, Sperm and Society. Insights into the evolutionary potential of sexual conflict in insects: a fundamental question in evolutionary biology**

2007 : \$178,000

2008 : \$167,000

2009 : \$165,000

2010 : \$165,000

2011 : \$165,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

QEII Dr BC Baer

Administering Organisation The University of Western Australia

Project Summary

Social insects are biologically and economically important species. Honeybees or stingless bees are used for crop pollination and honey production and invasive ants or termites are severe pest species causing economic damage. Part of the biological success of social insects is based on the capability to produce colonies with many workers although colonies typically contain only one or very few reproductives. Consequently, colony success is bound to queen fertility and studying social insect reproduction can therefore optimize breeding regimes of species of interest or offer new possibilities to control pest species. Detailed information on sperm form and function will provide pioneering insights into the complexity of sexual reproduction.

DP0771294 A/Prof M Bennamoun; Dr DQ Huynh; Prof RA Owens

Approved Project Title **Automated Determination of the Pose of a Human from Visual Information - Markerless 3D Pose Recovery of Humans from Videos**

2007 : \$92,000

2008 : \$85,000

2009 : \$80,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Western Australia

Project Summary

The development of 3D human pose recovery has been sought by computer vision researchers for many years. Our results will, firstly, have benefit for Australia's standing in the international computer vision community. Over time, the research outcomes will be developed into a software product for rehabilitation analysis by recognizing discrepancies between the walking patterns of healthy individuals and those with abnormalities as a result of accidents or diseases. The Australian economy will benefit by the reduction in the lifetime cost of injuries. This software will also provide benefits to the movie animation, computer games industry, and the training of athletes.

DP0770748 Prof DG Blair; Dr L Ju; Dr C Zhao; Dr DH Reitze; Dr DH Shoemaker

Approved Project Title **Control of Instabilities in Advanced Gravitational Wave Detectors**

2007 : \$270,307

2008 : \$270,307

2009 : \$270,307

2010 : \$48,307

2011 : \$48,307

Primary RFCD 2404 OPTICAL PHYSICS

ARF Dr L Ju

Administering Organisation The University of Western Australia

Project Summary

Gravitational wave technology from UWA has already given rise to significant spin-offs including sapphire oscillators for radar applications and vibration isolators for airborne mineral exploration. This project will lead to techniques for increasing the sensitivity of already extraordinary sensitive instruments, and could have applications in many areas. The project will strengthen Australia's role in the world wide quest to detect gravitational waves, which is one of the most significant and challenging human endeavours. The project will use the superb national research facility at Gingin. Its content contributes to the Eureka Prize winning Gravity Discovery Centre also located at the site, which is a major centre for science education.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770167 Prof RJ Bosworth

Approved Project Title **Rome and its histories 1750-2000: an iconic city's past and its importance to the present**

2007 : \$46,837
2008 : \$40,837
2009 : \$32,294

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Western Australia

Project Summary

This study explores the many ways in which the past in Rome, the 'eternal city', has been debated and portrayed by historians but also by groups as diverse as Catholics, city planners, archaeologists and tourists. The outcome will be a novel account from which we can draw lessons regarding the multiple uses of history to better understand the impact of heritage on contemporary lives.

DP0770938 Dr ZQ Chen; Dr RJ Twitchett; Dr J Tong; Dr S Xie

Approved Project Title **Reconstruction of marine ecosystems following the greatest mass extinction during the Phanerozoic history of Earth life: Lessons for the present**

2007 : \$136,614
2008 : \$128,614
2009 : \$104,614
2010 : \$96,614
2011 : \$96,614

Primary RFCD 2601 GEOLOGY
ARF Dr ZQ Chen

Administering Organisation The University of Western Australia

Project Summary

Frequent defaunation events strongly threaten sustainable development of marine resources and human environments especially in countries that are surrounded by oceans such as Australia. By analysing recovery mechanisms of marine ecosystems following the Permian-Triassic mass extinction, the greatest crisis of Earth life, we will develop predictive tools for analysing restoration of modern marine defaunated ecosystems. Understanding biotic extinction and recovery is crucial to understanding the evolution of the Earth's biosphere. This study increases Australia's research profile on this global issue. The target strata are quality oil source rocks in Perth Basin, and thus this project is beneficial to the Australian petroleum industry.

DP0774266 Prof KW Clements

Approved Project Title **International Comparisons of Consumption, Incomes and Prices**

2007 : \$59,410
2008 : \$59,094
2009 : \$64,434

Primary RFCD 3401 ECONOMIC THEORY

Administering Organisation The University of Western Australia

Project Summary

This project will provide insights into the workings of the world economy, and how it might change in the future. This will be beneficial to the Australian economy as the role of international trade in goods, people and capital is likely to become even more important to us in the future. The project will also enhance Australia's reputation for producing high-level research of both a fundamental and applied nature in consumption economics and international economics. It is hoped that the training of research students will be a further benefit of the project.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0772702 Prof R Da Silva Rosa; Prof I Izan; Dr M Bugeja

Approved Project Title **The Role of Directors in Corporate Takeovers**

2007 : \$56,000

2008 : \$59,000

2009 : \$64,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The University of Western Australia

Project Summary

This research deals with one of the causes and consequences of mergers and acquisitions (M&A) for boards of directors of companies involved in M&As. The Federal Government's Corporate Law and Economic Reform Program (CLERP), Paper No:3 states that corporate governance practices by Australian companies should be continuously monitored by the Australian Stock Exchange and relevant industries and professional bodies. Our research on the extent to which directors get penalised and/or rewarded for acquisition decisions depending on the outcomes of the M&A, contribute towards this monitoring.

DP0770257 Prof JW Davidson; Prof GE McPherson

Approved Project Title **From child learner to adult musician: Factors leading to success and ongoing participation in music**

2007 : \$80,000

2008 : \$80,000

2009 : \$80,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Western Australia

Project Summary

Building on recommendations from the Commonwealth Government's National Review of School Music Education (2005), this project seeks to clarify the factors that facilitate engagement in music. Building on data collected 10 years ago, the proposed follow up study will enable us to trace how Australian education in the form of school instrumental programs influence musical development, interest and attainment from childhood through to early adulthood. With this information, the study will enable us to identify how Australian education can be developed to facilitate the life-long enjoyment that artistic appreciation and participation can offer as a result of school music.

DP0769992 A/Prof JM Dell; Dr RH Sewell

Approved Project Title **Growth dynamics and innovative spectroscopic techniques for real-time control of advanced electronics materials grown by molecular beam epitaxy**

2007 : \$180,000

2008 : \$102,148

2009 : \$102,148

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

APD Dr RH Sewell

Administering Organisation The University of Western Australia

Project Summary

Many important semiconductor devices for communications, lasers, high speed electronics and optical sensing are based on materials grown by Molecular Beam Epitaxy (MBE). This research will provide the first measurements of the reactions taking place during MBE and thus enable accurate growth of the complex multi-layered material required for improved semiconductor devices. In particular, this project will make a major contribution to Australia's established capability to produce and develop state-of-the art infrared sensors as required for defence applications, remote sensing of minerals and pollutants, chemical analysis, and health diagnostics. PhD students will be trained in advanced semiconductor growth and optical sensing technologies.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0773152 Dr H Eubel
Approved Project Title **Protein Complexes and Supercomplexes of Plant Organelles**
2007 : \$77,030
2008 : \$77,030
2009 : \$77,030
Primary RFCD 3002 CROP AND PASTURE PRODUCTION
APD Dr H Eubel
Administering Organisation The University of Western Australia

Project Summary

Ample parts of plant primary metabolism occur in subcellular structures called mitochondria, plastids and peroxisomes. They are vital for plant growth and development and are central to the early success of germinating and growing seedlings. This project intends to analyze the protein complexes and supercomplexes within these organelles using state of the art instrumentation and technologies. Findings from this research have the potential to directly flow into the plant biotechnology industry and could assist the future development of Australian agriculture through genetic improvements. The expertise developed by this work will ensure that Australia is well placed to meet future needs and to generally improve agricultural technology.

DP0772498 Dr JP Evans; Dr F Garcia-Gonzalez
Approved Project Title **Sources of genetic and phenotypic variation in sexual selection**
2007 : \$117,841
2008 : \$110,000
2009 : \$113,000
Primary RFCD 2707 ECOLOGY AND EVOLUTION
Administering Organisation The University of Western Australia

Project Summary

This project will contribute towards Australia's reputation as a country where excellent and original research in evolutionary biology is conducted. The project will focus on the evolution of mate choice in the Western Australian rainbowfish, which has never been formally studied. Our research will therefore work towards a better understanding of Australian native fauna. Conceptually, the work encompasses new and innovative experimental procedures that will address fundamental questions in sexual selection. The results will ultimately be geared towards publication in the highest ranking journals, thereby promoting Australian science on the international stage. Australian science will further benefit from the training of young scientists.

DP0771348 Dr C Gaudin
Approved Project Title **Follower-embedded plate anchors to underpin economic development in ultra deep water**
2007 : \$55,618
2008 : \$53,307
2009 : \$50,000
Primary RFCD 2908 CIVIL ENGINEERING
Administering Organisation The University of Western Australia

Project Summary

Oil and gas is a key Australian industry, worth over \$15 billion annually. In order to maintain current hydrocarbon production levels, Australian offshore oil and gas companies are extending their capabilities beyond the 2000 metre water depth limit. The offshore industry has identified economic and geotechnical limitations of current anchoring technology to be the major challenge that must be overcome in order to make this transition into deep and ultra-deep water. The research proposed in this project focuses directly on this critical issue, with potential for immediate application to the Australian offshore oil and gas industry, and ensuring the continued viability of the key oil and gas industry in Australia.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0771037 Prof G Griffiths
Approved Project Title **Mission texts and the representation of Africa in America 1870-1914**
2007 : \$32,000
2008 : \$40,000
2009 : \$45,000
Primary RFCD 4202 LITERATURE STUDIES
Administering Organisation The University of Western Australia

Project Summary

Australia is now firmly linked to America in cultural and political terms. This project helps us to understand how American attitudes to overseas expansion came about in the period when America was expanding its control on its own continent and in the world at large. Explanations of this to date have neglected to examine the role of religious organisations and texts in promoting the ideas of other peoples and cultures which formed America's modern attitude to the world beyond its shores. As religion becomes increasingly recognised as a powerful factor in identity politics this project helps us to understand the roots of this connection and apply the knowledge to our current situation.

DP0773251 Dr A Hailu; Dr RG Chambers
Approved Project Title **Designing better soil quality indexes to improve land and environmental management**
2007 : \$81,018
Primary RFCD 3402 APPLIED ECONOMICS
Administering Organisation The University of Western Australia

Project Summary

This project will develop sound methods for capturing diverse soil quality attributes in summary soil quality indexes to facilitate wiser land and environmental management. The project will generate benefits through: 1) improvements in the sustainability of our agricultural industries by providing better tools for matching soils with crops and for more efficient chemical input use on farms, 2) improvements in environmental water quality through reductions in nonpoint source pollution from agriculture, 3) tools for monitoring the recovery of degraded agricultural or mining soil resources, and 4) better conservation contract design.

DP0774061 Dr H Hao
Approved Project Title **Blast Damage and Fragmentation Prediction for Occupants and Structure Protection**
2007 : \$100,000
2008 : \$80,000
2009 : \$70,000
Primary RFCD 2908 CIVIL ENGINEERING
Administering Organisation The University of Western Australia

Project Summary

Protecting infrastructures against blast loads from terrorist bombing or accidental explosion is a challenge. Researchers have been working on developing a numerical model, but the progress is slow owing to difficulties in modelling nonlinear and high strain rate damage process. Most blast effect assessment is based on empirical relations from blast tests. These have been demonstrated not necessarily yielding accurate prediction owing to variations of structural properties from the test model. A reliable numerical model is therefore important. It will result in big savings from blast tests, and better prediction of blast effects for structure and occupant protection. It will have applications in civil, mining and defence engineering.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770605 A/Prof YA Haskell; Prof S Starkstein

Approved Project Title **Psychosomatic Illness in Early Modern Italy: lessons for modern psychiatric theory and practice**

2007 : \$56,294
2008 : \$40,294
2009 : \$32,294

Primary RFCID 3706 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE

Administering Organisation The University of Western Australia

Project Summary

This pioneering collaboration between researchers in humanities and medicine will investigate the ways psychosomatic illness was defined and spread in early modern Italy. Epidemics of such illness still occur today and have had a major social and economic impact on Australia in recent decades. Our project will draw lessons for modern psychiatric theory and practice from historical and cultural differences in the conceptualisation and communication of 'hypochondria'. It will shed light on a very contemporary ethical dilemma in psychiatry: should doctors lie to 'hypochondriacal' patients? It will also contribute to current debates on the role of disease labels and information in the incidence and 'infectiousness' of psychosomatic illness.

DP0773823 Prof J Imberger; Dr JP Antenucci; Dr C Dallimore; Dr T Zohary; Dr A Sukenik; Dr G Gal; Dr YZ Yacobi; Prof RF Hauer

Approved Project Title **Factors controlling phytoplankton patchiness in a seasonally stratified lake**

2007 : \$70,000
2008 : \$140,000
2009 : \$25,118

Primary RFCID 2911 ENVIRONMENTAL ENGINEERING

Administering Organisation The University of Western Australia

Project Summary

This project will determine what processes result in the formation of phytoplankton patches in lakes, over what scale, and how they can be parameterized into models to assist in managing aquatic systems. This will allow key parameters to be measured at the correct time and space scales. The Controlled Lagrangian Drogue coupled with correctly parameterized hydrodynamic and water quality models will provide the Australian and International water industry with tools to measure and predict phytoplankton patchiness and make decisions about water quality treatment, offtake regimes and reservoir management. This will minimize the economic costs of water quality management and enhance the security of the quality of our water resources.

DP0770923 Dr LR Jeffery; Prof GI Rhodes; Dr E McKone; Dr D Maurer; Dr E Pellicano

Approved Project Title **The Role of Adaptive Coding Mechanisms in the Development of Face Perception.**

2007 : \$104,001
2008 : \$96,001
2009 : \$109,001
2010 : \$65,001

Primary RFCID 3801 PSYCHOLOGY

APD Dr LR Jeffery

Administering Organisation The University of Western Australia

Project Summary

Faces are immensely rich in social information, and early difficulties in extracting such information can have profound consequences for later social functioning. This project will provide insights into the ways in which our face-reading abilities develop throughout childhood. In addition to helping us better understand normal social development, this research will provide a foundation for understanding how face-reading difficulties can affect people with developmental disorders (such as autism), how face-reading can be disrupted in individuals whose early visual experience is affected by cataracts at birth, and how such difficulties might be alleviated through clinical intervention.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770666 Prof S Lewandowsky; Prof Dr K Oberauer

Approved Project Title **Keeping Memory Current: Updating and Discounting of Information**

2007 : \$126,600
2008 : \$138,500
2009 : \$142,000
2010 : \$142,000
2011 : \$145,000

Primary RFCD 3801 PSYCHOLOGY
APF Prof S Lewandowsky

Administering Organisation The University of Western Australia

Project Summary

This project is about understanding the human cognitive capacity to manage change. The need to manage change is a common thread that permeates nearly all National Research Priorities and is a central issue in an information society. The applied component of the project will develop techniques to improve the capabilities of individuals and communities to rely on up-to-date knowledge during decision making. The project will also contribute to psychological science in numerous ways. Basic research in psychology is of particular national benefit because the available national research funding is commensurate with the requirements of world-class research in psychology.

DP0770228 Dr Z Li; Prof D Evans; Prof Dr E Hegner; Prof P Hoffman; Asst Prof G Jiang; Prof X Li

Approved Project Title **Neoproterozoic global geodynamic and climatic events: were they linked?**

2007 : \$150,000
2008 : \$60,000
2009 : \$20,000

Primary RFCD 2601 GEOLOGY

Administering Organisation The University of Western Australia

Project Summary

This project will study a unique cluster of global geodynamic and climatic events 850-700 million years ago that will help us to understand the interactions between the Earth's deep mantle, its crust, and its atmospheric climate. Academic values aside, the work will bring direct benefit to the Australian industry. Knowledge on the distribution of the Neoproterozoic plume events will provide new exploration targets for Ni-Cu-PGE and V-Ti deposits. Better constrained palaeogeography will help to locate mineral-rich crustal provinces that were once connected. Understanding climatic consequences of global geodynamic events will help to better understand and respond to climate changes.

DP0770094 Dr RJ Lowe

Approved Project Title **Hydrodynamics of Fringing Reef Systems**

2007 : \$92,030
2008 : \$80,030
2009 : \$79,030

Primary RFCD 2604 OCEANOGRAPHY
APD Dr RJ Lowe

Administering Organisation The University of Western Australia

Project Summary

Ningaloo Marine Park is part of the National Representative System of Marine Protected Areas. Coral reefs are in a state of decline worldwide, yet Ningaloo Reef has remained in a relatively pristine state. However, its close proximity to land makes it particularly vulnerable to human activities, which are forecast to significantly grow in the near future. Results from this project will advance our ability to predict circulation on reefs and other similar coastal systems. This will provide insight into various ecological processes that are linked to hydrodynamics (e.g. recruitment), and will provide a foundation for conducting risk analysis of processes that threaten the integrity of nearshore environments (e.g. contaminant spills).

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0772361 Prof C MacLeod; Prof A Mathews; Prof E Fox; Dr CR Hirsch; Dr E Wilson

Approved Project Title **Selective information processing and anxiety problems**

2007 : \$93,801
2008 : \$94,801
2009 : \$97,801
2010 : \$99,801
2011 : \$58,500

Primary RFCD 3801 PSYCHOLOGY

APD Dr E Wilson

Administering Organisation The University of Western Australia

Project Summary

Anxiety problems cost Australia over \$1 billion per annum, and affect up to 16% of some Australian populations. Previous research by the applicants, and others, recently has established that certain patterns of selective information processing causally underpin elevated vulnerability to anxiety. The present program will serve to distinguish the functional contributions made by two specific classes of processing selectivity to two key dimensions of anxiety vulnerability. It is designed to produce novel cognitive technologies capable not only of predicting, but also of attenuating, both the tendency to experience anxiety reactions to stress, and the subsequent persistent of anxiety over time.

DP0773836 A/Prof MT Maybery; Dr DL Van Valkenburg; Dr F Parmentier; Prof DM Jones; Prof M Kubovy

Approved Project Title **Working Memory: The Binding of Spatial and Nonspatial Features in the Retention of Visual and Auditory Information**

2007 : \$48,000
2008 : \$67,000
2009 : \$72,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation The University of Western Australia

Project Summary

By advancing the understanding of how integrated representations are retained in memory for the features of visual objects and the features of sounds, the research will provide new theoretical insights as well as new methods for investigating several forms of psychopathology. Deficits in feature binding have been argued to be implicated in autism, in the auditory hallucinations experienced by individuals with schizophrenia, and in memory decline with advancing age. By investigating these deficits using insights from the proposed study, researchers may be able to develop ways to ameliorate the adverse effects of the deficits.

DP0771505 Dr IA McLean; Mr JG Barrett-Lennard

Approved Project Title **The impact of Aboriginal art on contemporary urban Australian art**

2007 : \$35,000
2008 : \$42,147
2009 : \$42,147

Primary RFCD 4199 OTHER ARTS

Administering Organisation The University of Western Australia

Project Summary

With art people picture and shape their sense of self and national identity. In a time of increasing fragmentation of these identities it is imperative to better understand the shifting politics of representation in today's world. Australia's relationship with its indigenous populations has been the source of major divisions in the Australian community. By showing the positive impact of Aboriginal art on contemporary art, this project will contribute to a more cohesive national identity. The publication of three books, a national touring exhibition and a web-based database will contribute significantly to the intellectual life of the country and bring this important achievement of Australian cultural life to the wider public.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0771156 Prof AH Millar

Approved Project Title **The role of changes to the proteome in the signalling of stress response in plant mitochondria**

2007 : \$154,061
2008 : \$154,061
2009 : \$154,061
2010 : \$154,061
2011 : \$154,061

Primary RFCD 2704 BOTANY
APF Prof AH Millar

Administering Organisation The University of Western Australia

Project Summary

Innovative agricultural solutions in Australia's harsh climate will be built on manipulating the expression of groups of genes and understanding how the proteins they encode operate to influence whole plant phenotypes under stress to provide more robust plants and improved plant products. Mitochondria are central components in plant metabolism. Stabilizing their function during stress has the potential to modify germination characteristics, early seedling vigour, and stress tolerance. Studying plant mitochondria supports the generation of intellectual property to be applied within Australia's plant-based industries and at the same time provide a rich intellectual environment for the training of students and researchers.

DP0770275 A/Prof K Miller; Prof N Knuckey; A/Prof SK Warfield

Approved Project Title **Neuroimage Registration Using a Graphical Processing Unit**

2007 : \$100,000
2008 : \$90,000
2009 : \$90,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

Administering Organisation The University of Western Australia

Project Summary

The proposed research will develop a computational framework, which will allow matching high quality pre-operative brain images with lower resolution images taken during neurosurgery. The key idea to be pursued is conducting computations on a Graphical Processing Unit (GPU). The success of this work will greatly improve effectiveness of brain tumour removal, and therefore improve clinical outcomes. The proposed work will provide enabling technology for other areas of computer aided medicine, such as virtual reality operation planning systems with realistic force and tactile feedback, control systems of neurosurgical robots with tissue deformation prediction module, etc.

DP0770213 Prof PW Miller; Dr ER Birch; Dr AT Le

Approved Project Title **Wage Determination and the New Household Economics**

2007 : \$80,000
2008 : \$80,000
2009 : \$80,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The University of Western Australia

Project Summary

By linking wage outcomes and occupational attainment to home time activities and the human capital and other characteristics of partners, this project should help establish the basis for the payoffs to schooling, the gender pay gap and the marriage wage premium in Australia. A focus on the household allocation of time, with a possible emphasis on child care, may emerge as an important consideration in discussion of the gender wage gap, and of the glass ceiling effects shown in recent research and in the media to be an important feature of the Australian labour market.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0774645 Prof Dr J Pan
Approved Project Title **Active control of vibration in marine riser systems**
2007 : \$130,000
2008 : \$125,000
2009 : \$120,000
Primary RFCD 2905 MECHANICAL AND INDUSTRIAL ENGINEERING
Administering Organisation The University of Western Australia

Project Summary

Effective control of vibrations of riser/drill rigs and vessels is an important measure of the technical quality, productivity, and environmental protection from pollution of the oil and gas industry in a country. The successful completion of this project promises to put the Australian oil and gas industry in a leading position in this area. Due to the multi-disciplinary nature of this project, the development of this section of the shipbuilding industry will also stimulate the development in many other areas such as structure dynamics, control sensors, actuators, electronics and control.

DP0773839 Dr E Pasternak
Approved Project Title **Negative Poisson's ratio and negative stiffness: rational approach to hybrid materials with internally engineered architecture**
2007 : \$100,000
2008 : \$90,000
2009 : \$90,000
Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING
Administering Organisation The University of Western Australia

Project Summary

The project falls within Research Priority 3: Frontier Technologies for Building and Transforming Australian Industries. This generic work involves cutting-edge multidisciplinary research leading to better understanding of the fundamental principles governing the behaviour of hybrid materials. The proposed framework of internally engineered architecture will enrich the existing set of available methods of designing new materials, extend the knowledge base of the discipline and maintain Australia's leading position in the field. Australian Industry will benefit directly from unique engineering properties and functionalities that hybrids provide. This contributes to Priority Goals: Breakthrough Science and Advanced Materials.

DP0770915 Prof CE Praeger; Dr MR Giudici; A/Prof C Li; A/Prof TJ Penttila
Approved Project Title **Finite permutation groups and flag-transitive incidence structures**
2007 : \$209,354
2008 : \$210,000
2009 : \$200,000
2010 : \$190,000
2011 : \$190,000
Primary RFCD 2301 MATHEMATICS
ARF Dr MR Giudici
APF Prof CE Praeger
Administering Organisation The University of Western Australia

Project Summary

Mathematics is the enabling discipline for all the sciences and so a strong mathematical research community in Australia provides the foundations for future discoveries in science and technology. By developing new theory for permutation groups, producing a new paradigm for the study of Buekenhout geometries and classifying certain families of flag-transitive incidence structures, we will enhance Australia's leading position in Permutation Group Theory, Algebraic Graph Theory and Finite Geometry. This will attract international and Australian postgraduate students and visitors, and strengthen the research activities of Australia by enhancing the collaboration between UWA and leading international universities.

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DP0769967 Prof CL Raston; A/Prof TG St Pierre

Approved Project Title **Tuneable monodispersed nanoparticles and nanoparticle superstructures**

2007 : \$127,000

2008 : \$120,000

2009 : \$120,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Organisation The University of Western Australia

Project Summary

Integrating spinning disc processing (SDP), which is new to Australia, with advances in magnetic properties of nanoparticles will have wide ranging applications in nanotechnology. The cutting edge research will foster collaboration with industry, and lead to new industries in memory device technology, nano-medicine, and catalysis, through exploiting commercial opportunities. Continuous flow SDP technology in industry has a small footprint and low capital cost outlay. The project will provide excellent research training in a range of scientific skills and in professional development, and will involve overseas PhD exchange programs. The exciting research incorporating nano-toxicology will enhance public opinion towards nanotechnology.

DP0774113 Dr M Ruitenber

Approved Project Title **CX3C chemokine signalling in the olfactory epithelium and its role in the self regeneration of the olfactory system**

2007 : \$100,000

2008 : \$95,000

2009 : \$95,000

Primary RFCD 2705 ZOOLOGY

APD Dr M Ruitenber

Administering Organisation The University of Western Australia

Project Summary

The current proposal will explore new venues in adult neural stem cell research and contribute to the further development of molecular biology and neuroscience research in Western Australia and Australia. The use of neural stem cells holds therapeutic promise for the treatment of a wide variety of neurological conditions, including neurotrauma and stroke. The proposed research will provide new data on the fundamental cellular and molecular events that are required to trigger the birth, differentiation and conditions for growth of new neurons in the adult nervous system. The generation of such insights will be critical for any translational research.

DP0771111 Prof DD Sampson; Prof MD Grounds; Prof S Boppart

Approved Project Title **Coherent optical tissue biopsy and analysis targeting muscle pathology**

2007 : \$198,478

2008 : \$220,000

2009 : \$200,000

2010 : \$180,000

Primary RFCD 2915 BIOMEDICAL ENGINEERING

Administering Organisation The University of Western Australia

Project Summary

This international, interdisciplinary collaborative research should change the way structures in tissues are characterised with broad impact on health, biotechnology, and the meat industry. Specific benefits include: a large reduction in the time/effort required for the ubiquitous process of histology of muscle and other tissue sections and samples; a large reduction in the number of animals required in experimentation and the possibility of time sequential studies of the same animal; and in muscular dystrophy in humans, a new capability in the direct assessment of muscle tissue and the disease treatment and progression. This suite of advances should generate intellectual property of major commercial importance.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0771680 Prof LW Simmons

Approved Project Title **Sperm Competition and Sexual Selection: answering fundamental questions in evolutionary biology**

2007 : \$136,272
2008 : \$100,000
2009 : \$95,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The University of Western Australia

Project Summary

This research will yield results that are at the cutting-edge in evolutionary biology, that will have a significant international impact, promoting the international profile of Australian science. The award will build on an existing world-class centre of excellence for research, and will train internationally competitive research scientists, adding to Australia's scientific capabilities. The research centre's connections with local fertility clinics, and their work on human sperm quality, has the potential to inform those studying human fertility.

DP0772155 Dr NL Taylor

Approved Project Title **Adaptations of plant mitochondria during cold acclimation in Arabidopsis thaliana: towards an understanding of plant cold acclimation**

2007 : \$77,030
2008 : \$77,030
2009 : \$77,030

Primary RFCD 3002 CROP AND PASTURE PRODUCTION

APD Dr NL Taylor

Administering Organisation The University of Western Australia

Project Summary

Frost damage is a major cost to agricultural producers and some crop plant species needlessly adapt to cold, when they are grown in temperate regions or in glasshouses, which leads to decreased production. The principal outcome of this project will be to greatly extend our knowledge about plant mitochondrial responses to environmental cold stress and what role they have in helping plants adapt to environmental change. An understanding of cold acclimation may allow the production of plants with altered cold acclimation phenotypes and greater frost tolerance.

DP0770055 A/Prof WM Taylor; Prof MP Levine

Approved Project Title **A new framework for the re-evaluation of the quality of the built environment in Australia**

2007 : \$102,294
2008 : \$94,147
2009 : \$50,000

Primary RFCD 4401 PHILOSOPHY

Administering Organisation The University of Western Australia

Project Summary

This project provides a framework and ethical perspective for the re-evaluation of the quality of the built environment in Australia given the nation's changing demographics, its history of migration and assessments of the movements of its people today. It will assess the impact of globalisation, including new modes of transport and communication, building technology, land and urban development in terms of individual and national identity. It seeks to re-evaluate the notion of Australian community in light of hitherto, little-considered transient characteristics. It seeks to question longstanding assumptions about the possibility of, and needs for a 'fixed address' upon which both individual perceptions and government policies are made.

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DP0772742 Prof RJ Watling; Prof CE Oxnard; A/Prof I Dadour

Approved Project Title **Estimating Time Since Death: Application of Radionuclide Technology**

2007 : \$152,000

2008 : \$163,000

2009 : \$175,000

Primary RFCD 3703 ANTHROPOLOGY

Administering Organisation The University of Western Australia

Project Summary

This study will

- advance the knowledge base and expertise of Australian anthropologists and forensic scientists through the development of an accurate method for determining time since death from skeletal remains
- directly assist police and forensic forces in their fight against crime, which is fundamental in ensuring the national security of Australia
- promote Australia as a leader in the design of new evidence-based forensic methods
- raise the profile of Australian scientists in international investigations involving skeletal remains (e.g. Bali bombing, Boxing Day Tsunami, Human Rights Issues)