

New South Wales

The University of Newcastle

DP0773617 Dr E Doran; Prof D Henry; A/Prof G Salkeld; Dr J Robertson

Approved Project Title **Moral Hazard and the Pharmaceutical Benefits Scheme**

2007 : \$96,000

2008 : \$70,000

Primary RFCD 3212 PUBLIC HEALTH AND HEALTH SERVICES

Administering Organisation The University of Newcastle

Project Summary

The extent and significance of moral hazard in the PBS is an issue of significance for all Australians. Pharmaceuticals are a central feature in maintaining the health of Australians and with factors such as an ageing population and technological advances the centrality of pharmaceuticals is likely to be consolidated. One, if not the, major challenge will be how to provide pharmaceuticals efficiently, equitably and sustainably. If significant and extensive, moral hazard potentially compromises PBS efficiency and threatens sustainability. The proposed project represents a significant empirical contribution to understanding the impact of moral hazard on the PBS and will make a significant contribution towards making the PBS sustainable.

DP0773700 Dr RN Drysdale; Dr JC Hellstrom; Dr R Maas; Dr G- Zanchetta; Prof AE Fallick; Prof G Lohmann

Approved Project Title **Improving climate models through new insights on long-term inter-hemispheric climate synchronicity from speleothems**

2007 : \$150,000

2008 : \$142,000

2009 : \$37,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Administering Organisation The University of Newcastle

Project Summary

It is important that palaeoclimatologists continue to improve understanding of how the Earth responds to climate forcing, so that climate models can be rigorously validated and refined. Since the Earth responds to most of this forcing over time scales that exceed the length of instrumental weather measurements, the recovery of datable palaeoclimate archives that are highly sensitive to past climate changes is essential. Our project will provide important new palaeoclimate data from both hemispheres on how key regions of the Earth responded to past climate changes. This will bring improved understanding of past oceanic-atmospheric processes that can be fed into climate models, ultimately producing better forecasts to the benefit of all Australians.

DP0772492 Prof PJ Foreman; Dr M Arthur-Kelly

Approved Project Title **Partner training and communication outcomes for students with multiple and severe disabilities**

2007 : \$36,000

2008 : \$78,600

2009 : \$38,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Newcastle

Project Summary

This research has the potential to benefit one of the most disadvantaged groups in the community: students with multiple and severe disabilities. These students typically spend more than 70% of the school day with no communication with teachers, teacher aides or other students. The proposed research will investigate whether it is possible to improve levels of communication and engagement through training teachers and teacher aides as effective communication partners. Higher levels of communication at school will improve Quality of Life for these students. This research will inform the development of training programs for school staff working with students with multiple and severe disabilities.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0772504 Prof BJ Fraser; Dr CC Chaston

Approved Project Title **Electromagnetic Ion Cyclotron Waves and Magnetosphere Plasma Dynamics**

2007 : \$82,000

2008 : \$82,000

2009 : \$85,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Administering Organisation The University of Newcastle

Project Summary

Space weather, manifest as magnetic storms in the Earth's magnetosphere, can severely disrupt and damage advanced technological systems operating in space and on the ground. Spacecraft may experience operational anomalies, pipeline corrosion may eventuate in the long term, and the performance of GPS navigation systems, HF communication systems, mobile phone networks, and surveillance radars, may be degraded. Knowledge of the near-Earth space environment under which these problems occur is extremely important. This project identifies relevant mechanisms. The research consolidates Australia's international space profile, provides excellent postgraduate training in the field, and contributes to Australia's future technological development.

DP0773584 Prof JS Jin; Dr S Luo; A/Prof U Schall

Approved Project Title **Automatic detection of the circle of Willis in neuro-images using multi-scale gradient calculation and knowledge-based genetic algorithms**

2007 : \$72,000

2008 : \$70,000

2009 : \$68,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Newcastle

Project Summary

Stroke is the third most common cause of death and a major contributor to long term disability in Australia. The most efficient way of preventing stroke from happening is to detect related symptoms early. The group of cerebral blood vessels that closely related to strokes is the circle of Willis (CoW). We build a system that can automatically detect and quantify CoW in neuroimages, providing ways of preventing strokes from happening. The project will enhance Australia's leading position in promoting and maintaining good health, especially in preventive healthcare.

DP0772127 Prof MG Jones

Approved Project Title **Modelling of Bypass Pneumatic Conveying Systems**

2007 : \$90,000

2008 : \$85,000

2009 : \$80,000

Primary RFCD 2905 MECHANICAL AND INDUSTRIAL ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

Many of the physical items we use in our daily lives have at some point required transport and handling as powdered or granular materials during the manufacturing process. Be it food (sugar, flour), chemicals (soap powders, detergents) or power generation (coal and ash); each of these industries uses the flexibility of pipelines as a transport mechanism. However, not all materials will convey reliably in conventional pipelines. This project will provide the fundamental understanding of how bypass systems can overcome this problem by conditioning the material along the pipeline length. The results will lead to better pipeline design outcomes that will ultimately expand the use of the cost effective process of pneumatic pipeline conveying.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0773000 Prof GA Kuczera; Dr MA Thyer; A/Prof SW Franks

Approved Project Title **Efficient and Robust Prediction at Ungauged Catchments**

2007 : \$65,000

2008 : \$60,000

2009 : \$55,000

Primary RFCD 2911 ENVIRONMENTAL ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

Hydrological models are an integral part of virtually all environmental models formulated at the catchment scale. They are used in the planning, design and operation of water infrastructure. Despite the importance of these models limited rainfall and streamflow gauging forces these models to be routinely applied at ungauged locations where predictive power is poorly understood and almost always unsatisfactory. This project will directly benefit model users by providing (a) robust framework for quantifying uncertainty and (b) improved predictions at ungauged basins. This will provide more realistic guidance for design engineers and policy makers and be of significant benefit to a large range of Australian water users.

DP0771695 Prof RE Melchers; Prof MG Stewart

Approved Project Title **Modelling of Damage Progression and its Effects on the Expected Safety and Satisfactory Performance of Existing Reinforced Concrete Infrastructure**

2007 : \$90,000

2008 : \$80,000

2009 : \$70,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

The extent of reinforcement corrosion in existing infrastructure will influence demolish/repair decisions, maintenance strategies and hence the frequency, timing, extent and required level of efficiency and effectiveness of repairs. The project will provide improved evaluation of existing structural systems by considering improved deterioration modelling and predictions of safety and satisfactory performance. The potential economic benefits of greater precision in infrastructure replacement or repair strategies and of the risks involved are large given that the size of Australia's infrastructure stock is valued at over \$400 billion and its maintenance involves considerable costs.

DP0773561 A/Prof B Moghtaderi; Prof KP Galvin

Approved Project Title **Enhanced Mixing Through Particle Motion in Micro-Channels**

2007 : \$136,889

2008 : \$171,305

2009 : \$118,833

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Organisation The University of Newcastle

Project Summary

This study will help place Australia within the forefront of one the key technological endeavours of this century, the development of small-scale microfluidic devices, and, thus, should enable Australian industry to benefit relatively early from these new developments. This new research field seeks to exploit many of the major advances being made in science and engineering. Therefore, the work proposed here clearly addresses the Federal Government's National Research Priority 3, Frontier Technologies for Building and Transforming Australian Industries (priority goals: Breakthrough Science & Frontier Technology). The study will also support the research training of two postgraduate students.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0774651 A/Prof B Moghtaderi; Prof TF Wall

Approved Project Title **A Fundamental Study on Redox Behaviour of Oxygen Carriers in Chemical Looping Combustion**

2007 : \$155,000

2008 : \$105,000

2009 : \$105,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Organisation The University of Newcastle

Project Summary

Our goal here is to acquire fundamental knowledge about the redox behaviour of metal oxide oxygen carriers which, arguably, underpins the feasibility of the Chemical Looping Combustion (CLC) concept. Although the proposed work is fundamental and will contribute to the advancement of knowledge, the results will have immediate practical applications in power generation industry at both national and international levels. This should significantly contribute to the Australian Government's efforts in producing world class solutions for abatement of greenhouse emissions (Research Priority 1: An Environmentally Sustainable Australia, Priority Goal 1.4 - Reducing and capturing emissions in transport and energy generation).

DP0774287 A/Prof SO Moheimani; Prof RH Middleton

Approved Project Title **Robust Control of Electrostatic Microactuators**

2007 : \$230,000

2008 : \$190,000

2009 : \$180,000

2010 : \$170,000

2011 : \$100,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The University of Newcastle

Project Summary

This proposal seeks to address a number of fundamental problems associated with electrostatic microactuators that form an integral part of microelectromechanical systems (MEMS). Performance of these microactuators is limited due to the presence of a specific form of nonlinearity in their dynamics. In this research advanced and innovative feedback controllers will be developed to improve operational performance of such microactuators. The global MEMS market is projected to increase from \$10B in 2005 to \$40B in 2015. This project will enhance Australia's standing in this important high-tech field.

DP0773279 Dr PA Moscato; Prof RJ Scott; Dr MA Langston

Approved Project Title **Application of novel exact combinatorial optimisation techniques and metaheuristic methods for problems in cancer research**

2007 : \$72,485

2008 : \$80,326

2009 : \$85,480

Primary RFCD 2804 COMPUTATION THEORY AND MATHEMATICS

Administering Organisation The University of Newcastle

Project Summary

Novel biotechnologies are offering an unprecedented opportunity to understand the genetic basis of cancer development and progression. However, they present us with a challenge; new computational methods and improved mathematical models and algorithms need to be introduced to complement these technologies in the determination of the function of our individual genetic makeup, especially in connection with disease states. The project will deal with research questions and datasets related to some of the highest incidence cancers in Australia. This project will contribute towards the development of new powerful algorithms for pattern recognition for future "personalized" molecular diagnostics methods.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770278 Prof GE Murch

Approved Project Title **Computational design of titanium dioxide-based ceramics for the renewable energy technology platform: Solar-Hydrogen**

2007 : \$148,021

2008 : \$186,202

2009 : \$209,261

2010 : \$100,000

2011 : \$100,000

Primary RFCD 2914 MATERIALS ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

Hydrogen is a clean non-polluting fuel. Production of hydrogen (Solar-Hydrogen) directly from water and sunlight is a very appealing renewable energy technology. The key requirement to allow this technology to be adopted is finding an electrically suitable material. This research program takes an innovative approach by combining state of the art computational techniques to engineer advanced ceramics having sophisticated electrical signatures. These ceramics will be synthesized in a partner experimental program to gauge their efficiencies for hydrogen production. The program will provide the foundation for a renewable energy technology that will provide clean energy and energy independence for Australia.

DP0774086 A/Prof BM Ninness; Dr AG Wills

Approved Project Title **Advancing System Identification using Modern Optimisation Methods**

2007 : \$87,030

2008 : \$82,030

2009 : \$77,030

Primary RFCD 2903 MANUFACTURING ENGINEERING

APD Dr AG Wills

Administering Organisation The University of Newcastle

Project Summary

This project lies within an ARC Research Priority Area. Namely, "Frontier Technologies". It involves the development of new technologies and fundamental theory that take data records from physical or abstract systems and generate mathematical models for use in prediction, control and diagnosis of the underlying system. In light of this, the project also lies within the ARC Research Priority Area of "Smart Information Use",

DP0770106 Prof MJ Ostwald; Dr SK Chalup

Approved Project Title **Shaping social and cultural spaces: the application of computer visualisation and machine learning techniques to the design of architectural and urban spaces**

2007 : \$118,991

2008 : \$100,838

2009 : \$56,000

Primary RFCD 3101 ARCHITECTURE AND URBAN ENVIRONMENT

Administering Organisation The University of Newcastle

Project Summary

The proposed research project provides a previously unavailable level of understanding of the experiential and symbolic characteristics of complex urban and architectural spaces. In a country that is experiencing increasing urban density there is an urgent need for the development of new tools, theories and design approaches that can produce spaces which are socially and culturally responsive.

The research project produces a leading-edge computational tool for analysing space, along with a conceptual advance in design theory. Both the tool and the theoretical advance will assist design practitioners, scholars, town planners and policy writers to shape rich, responsive and inclusive urban environments.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770704 Dr S Paolini; Prof J Harwood; Dr M Rubin

Approved Project Title **The Disproportionate Impact of Negative Contact on Category Salience and Prejudice: Explaining Why Intergroup Interactions Can Be Harmful**

2007 : \$63,001

2008 : \$63,001

2009 : \$63,001

2010 : \$63,001

Primary RFCD 3801 PSYCHOLOGY

APD Dr S Paolini

Administering Organisation The University of Newcastle

Project Summary

The social psychological literature suggests that face-to-face interactions between people of rival groups will reduce mutual prejudice and discrimination. The present research tests the novel prediction that negative face-to-face interactions have a greater probability of worsening broad intergroup relations than positive face-to-face interactions have of improving them. The research will benefit Australia by (a) explaining why intergroup conflict continues to be a key social issue in multicultural Australia despite increased intergroup interactions and by (b) informing policy makers about the social conditions that result in more conflicting intergroup relations as well as the social conditions that result in more harmonious relations.

DP0772490 Mr CM Phan

Approved Project Title **Influence of adsorbed surfactants on three phase contact line motion at high capillary number**

2007 : \$90,000

2008 : \$82,000

2009 : \$80,000

Primary RFCD 2906 CHEMICAL ENGINEERING

APD Mr CM Phan

Administering Organisation The University of Newcastle

Project Summary

The interaction between thin films and solid surfaces underpins the performance of a number of value-adding industrial processes, most notably metallurgical coating operations. Typically, these operations are performed at speeds well beyond the range of existing models, thereby limiting their value when changes in operation occur or when there are problems with product quality. Existing models are also limited by their inability to account for the presence of surfactants commonly used throughout industry. This study will produce a capability for predicting how velocity and local changes in molecular composition affect the wetting/dewetting of coated surfaces.

DP0772093 Prof I Raeburn; Dr A an Huef

Approved Project Title **Endomorphisms, transfer operators and Hilbert modules**

2007 : \$150,131

2008 : \$135,000

2009 : \$120,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The University of Newcastle

Project Summary

This project is in the general area of functional analysis, an area where both Newcastle University and the University of New South Wales have strong international reputations. The aim of the project is to study irreversible dynamics in the presence of transfer operators, as recently introduced by Professor Exel. The motivation comes from a variety of examples arising in different areas of mathematics, including number theory and graph theory. It is hoped that the results will give new understanding of the algebraic and analytic structure underlying the multi-resolution analyses used in approximation theory and Fourier analysis. This project will help ensure that Australia has a strong foundation in mathematics which will foster innovation.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0774012 Em/Prof AW Roberts; Dr CM Wensrich; Dr CA Wheeler

Approved Project Title **Modelling and Optimisation of Belt Conveyor Systems**

2007 : \$130,000

2008 : \$110,000

2009 : \$60,000

Primary RFCD 2905 MECHANICAL AND INDUSTRIAL ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

Belt conveyors are the arteries of Australia's heavy industries. Their efficiency and cost are critical to the productivity of our major export markets. A current trend in this area is the introduction of high-speed and long distance conveying. This has placed tremendous pressure on the current design standards which are in drastic need of re-evaluation. This project will address these deficiencies and build a strong foundation for future conveyor design. This will be achieved by developing rigorous mechanical models for conveyor mechanics and the application of state-of-the-art optimisation methods based on Darwinian natural selection. This will lead to significant improvements in the efficiency and running costs of belt conveyor systems.

DP0774184 Dr PM Saco; Prof GR Willgoose; Mr DJ Tongway

Approved Project Title **Role of vegetation patchiness and self organisation in the ecohydrologic response of water limited ecosystems to climate variability and change**

2007 : \$70,000

2008 : \$60,000

2009 : \$50,000

Primary RFCD 2911 ENVIRONMENTAL ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

The semi-arid Australian rangelands are some of the most sensitive regions to degradation and climate change, particularly with respect to hydrology and ecology. Our predictive ability in these environments is quite poor, however, climatic change (particularly changes in rainfall regimes) are expected to intensify vegetation patterning, intensify erosion and reduce runoff. This project will develop a modelling framework to better understand the impact of these natural (climate variability and change) and anthropogenic (grazing, deforestation) disturbances on runoff and erosion in these regions.

DP0772547 Dr MJ Schofield; A/Prof JA Grant

Approved Project Title **Supervision of psychotherapy: Understanding the processes that build professional competence**

2007 : \$70,000

2008 : \$41,000

2009 : \$83,000

Primary RFCD 3301 EDUCATION STUDIES

Administering Organisation The University of Newcastle

Project Summary

Psychotherapy can save lives and improve well-being. Clinical supervision is used to improve psychotherapy effectiveness and support therapists. This study contributes to the national research priorities of promoting and maintaining good health by building our knowledge of clinical supervision processes and how they influence therapist practice and client outcomes. The study will lead to an evidence-based model of effective supervision practice, which will enhance future service delivery, prevent therapist burnout, and improve client outcomes. The study will also inform development of: measures of core supervisory processes, clinical supervision practice standards, supervisor training, and professional development programs.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0770679 Mr MB Sheahan
Approved Project Title **The Dynamics of Plant Cell Division-Discovering the Mechanisms of Organelle Inheritance**
2007 : \$77,030
2008 : \$77,030
2009 : \$77,030
Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY
APD Mr MB Sheahan
Administering Organisation The University of Newcastle

Project Summary

This project seeks to understand molecular mechanisms responsible for organelle partitioning in dividing plant cells. Understanding these mechanisms will contribute new knowledge relevant to plant biotechnology (eg chloroplast transformation, cytoplasmic male sterility, plant development and totipotency) and thus to Australian agriculture broadly. This project will enhance Australian research capacity in the fields of organelle inheritance and plant cytoskeletal dynamics and thus will maintain Australia's leading reputation in these fields. In addition, the project will maintain a high quality and productive research environment capable of providing excellent research training for new scientists in this field.

DP0771131 Dr SR Weller; Dr CM Kellett
Approved Project Title **Dynamical systems and iterative decoding of low-density parity-check codes**
2007 : \$75,000
2008 : \$70,000
2009 : \$65,000
Primary RFCD 2805 DATA FORMAT
Administering Organisation The University of Newcastle

Project Summary

Modern telecommunication systems are increasingly built on principles of iteration and feedback. By contributing to the knowledge base of iterative telecommunication systems, this project addresses important fundamental problems in the area of telecommunications. The Federal Government has clearly indicated that it recognises the importance that information and communications technology (ICT) plays in the economic and social fabric of Australia, through the recent Innovation Action Plan, Backing Australia's Ability. These technologies are key drivers of the information economy, the spawning of new businesses, the transformation of established industries, the opening up of new export markets, and the creation of new jobs.

DP0774087 Dr JS Welsh; Prof GC Goodwin
Approved Project Title **Robust Experiment Design for Dynamical System Identification**
2007 : \$155,000
2008 : \$130,000
2009 : \$115,000
Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING
Administering Organisation The University of Newcastle

Project Summary

Innovative and new robust experiment design methodologies are a Frontier Technology for Transforming Australian Industries. By providing a solid foundation for generating high fidelity models, robust experiment design will, by the use of breakthrough science, facilitate the estimation of models in minimum time. Also, this will entail minimal disruption to the normal operation of the process under study. With the majority of advanced industrial process control systems reliant on accurate models significant savings could also be made due to the implicit improvement in process control.

Summary of Discovery Projects Proposals for Funding to Commence in 2007

DP0774419 Prof EW Wright; A/Prof MP Ellinghaus

Approved Project Title **Models of contract law: are broad principles better than detailed rules?**

2007 : \$62,000

2008 : \$62,000

Primary RFCD 3903 JUSTICE AND LEGAL STUDIES

Administering Organisation The University of Newcastle

Project Summary

Empirical confirmation that broad principles work better than detailed rules could lead to many economic and social benefits- it would supply a key to simplifying the law; contracts would be shorter and simpler, reducing the costs of doing business; contract disputes and litigation would be reduced, saving public and private expense; decision-making would be more accountable and transparent, improving the quality of justice; codifying the law would be more feasible; and harmonising Australian contract law with that of our international trade partners would be facilitated. The project thus has the potential to contribute to strengthening Australia's social and economic fabric (Priority Goal 4 of National Research Priority 2).

DP0772799 Dr H Ye; Dr Y Lin

Approved Project Title **A framework for modelling feature variability and dependencies in software product lines**

2007 : \$56,000

2008 : \$56,000

2009 : \$56,000

Primary RFCD 2803 COMPUTER SOFTWARE

Administering Organisation The University of Newcastle

Project Summary

In most Australian software development organisations software products are developed individually rather than product line based. This project will promote the awareness of product line based software development and provide a frontier technology, the effective feature modelling approaches, to help Australian software industry transform from the single product based development to the product line based development to achieve significant improvement on the productivity and the quality of the software development. This improvement will dramatically reduce the cost of software products and alleviate the pressure of skill shortage that currently threatens Australian economy.

DP0772929 Dr MR Yuce

Approved Project Title **New Approaches for Wireless Implantable Biomedical Devices**

2007 : \$61,000

2008 : \$61,000

2009 : \$61,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

Administering Organisation The University of Newcastle

Project Summary

Wireless biomedical implants of the future will interface with biological systems to perform physiological tasks such as vision restoration, reanimation of paralyzed limbs, and chemical sensing. The potential benefit to society will come not only from alleviating human suffering and improving quality of life, but also by reducing the health care costs now directed to assist people with disabilities such as blindness, stroke and spinal-cord injury survivors. Using similar technologies, cochlear implants have already restored functional hearing to over 100,000 deaf patients around the world. The outcomes of the project can also be applied to a variety of other applications such as environmental monitoring, security and identification systems.