

Summary of Discovery Projects Proposals for Funding to Commence in 2010

Victoria

RMIT University

DP1093115 Prof DJ Adams; Prof DJ Craik; Prof F Mari

Approved Project Title **Defining mechanisms of action of novel alpha-conotoxins at nicotinic receptor-channels**

2010 : \$ 300,000

2011 : \$ 260,000

2012 : \$ 280,000

2013 : \$ 280,000

2014 : \$ 280,000

Primary RFCD 3205 PHARMACOLOGY AND PHARMACEUTICAL SCIENCES

APF Prof DJ Adams

Administering Organisation RMIT University

Project Summary

Marine snails from the waters off the Australian coast produce an amazing variety of mini-proteins in their venoms called conotoxins that they use to capture prey. These conotoxins bind very specifically to receptors in our body associated with the transmission of nerve signals. We will use natural and synthetically modified conotoxins to selectively block particular types of neuronal 'receptors' to gain a greater understanding of how the nervous system functions. This knowledge will help in the design of new drugs to treat a variety of diseases and disorders. Essentially we will use a chemical armoury developed by the cone snail to design state-of-the-art mini-protein drugs.

DP1092717 Ms M Bhaskaran

Approved Project Title **Complementary metal-oxide-semiconductor (CMOS) -compatible ultra-high response piezoelectric thin films for efficient energy harvesting**

2010 : \$ 105,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

APD Ms M Bhaskaran

Administering Organisation RMIT University

Project Summary

Optimised piezoelectric thin films as precursors to realising silicon-based energy harvesting technology will result from this project. These ultra-high response films will be used to efficiently generate electrical energy from environmental mechanical energy sources, such as acoustic vibrations and biorhythms. Hurdles currently faced in realising energy harvesting technology will be overcome using this novel approach. This technology can be used to effectively operate low power portable devices and implantable bioelectronics. Energy harvesting with piezoelectric thin films will be a scientific breakthrough, critical in making Australia a leader in alternative energy technologies, complementing expertise in solar and fuel cells.

DP1094409 Prof JW McCulloch

Approved Project Title **Silicosis, Knowledge and Power: Transnational Responses to an Occupational Disease, 1902 to 2005.**

2010 : \$ 65,000

2011 : \$ 48,000

2012 : \$ 73,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation RMIT University

Project Summary

Silicosis is a global disease which has affected the health of Australian workers and the profitability of Australian companies. Recently, major international mining houses have begun to acknowledge their wider responsibilities, and publish statements on Sustainable Mining. However, poor practices in developing countries continue to shift the costs of production onto labour, thereby under-cutting producers who provide safer working environments. This project promises greater understanding of risk assessment and the processes of compensating workplace injuries. In doing so, it will contribute to the work of social movements supporting miners in their struggles for justice.

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DP1096153 A/Prof A Mitchell; Dr TG Nguyen; Prof T Koch

Approved Project Title **Novel silicon photonic devices harnessing new leakage behaviour**

2010 : \$ 80,000

2011 : \$ 80,000

2012 : \$ 70,000

2013 : \$ 70,000

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr TG Nguyen

Administering Organisation RMIT University

Project Summary

The continuing advance of microprocessor performance requires vast quantities of data to be transferred between on-chip processor cores and to the outside world. The transfer of data via metal wires cannot meet this demand due to limited bandwidth and astonishing heat generation. Low-loss photonic transport integrated onto the silicon chip offers a solution. With this project we will explore harnessing a newly discovered phenomenon in silicon photonics to achieve devices such as electrically pumped lasers and wavelength routers. The project will collaborate closely with researchers in the USA, but will focus on research of designs that can be created in Australia and licensed to major industry across the globe.

DP1093290 Prof L Padgham; Dr F Zambetta; Prof C Fudge; Dr A Drogoul

Approved Project Title **An Extensible agent-based framework for exploring climate change adaptation**

2010 : \$ 100,000

2011 : \$ 95,000

2012 : \$ 95,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation RMIT University

Project Summary

The benefit of this project is the provision of an extensible leading edge technological platform for exploration of critical problems of Climate Change Adaptation (CCA). This will enable policy makers and social scientists to explore the complex interactions of different approaches to adaptation thus informing this critical area understanding. The research questions addressed will also provide more general benefits in the area of agent based modelling and simulation, facilitating principled modelling of more complex entities within simulations. Building on top of a platform with an existing large user base facilitates contributions to the extensible platform, and the application area of CCA, by a wide range of people.

DP1094627 Prof L Padgham; Dr S Sardina; Dr JR Thangarajah

Approved Project Title **Intention Selection in Intelligent Agent Systems**

2010 : \$ 95,000

2011 : \$ 90,000

2012 : \$ 90,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation RMIT University

Project Summary

Although intelligent multi-tasking is the foundation of rational behaviour, very little work has been done to date. Work in this area will maintain Australia's reputation of being at the forefront of work in Intelligent Agents. It will also provide a basis which can later be further developed for inclusion in applications and agent platforms. Australia has a number of companies, such as Agent Oriented Software, and government organisations, such as the Bureau of Meteorology and the Department of Defence, which use agent technology. These companies would benefit from this work as it would tackle a long-standing key problem in the area of intelligent systems.

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DP1094486 Dr SJ Richardson; Dr LK Pattenden
Approved Project Title **Unravelling transthyretin amyloid, bounding ahead using wallabies**
2010 : \$ 75,000
2011 : \$ 75,000
2012 : \$ 75,000
Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY
Administering Organisation RMIT University

Project Summary

Each protein in our body has a unique shape that enables it to function correctly. For unknown reasons, some proteins can change their shape, aggregate with other proteins and stick to the outside of cells of major organs or nerves. This prevents those cells from working properly and results in disease. Transthyretin is a protein that changes shape and aggregates in the heart of most people over the age of 70. The disease is called Senile Systemic Amyloidosis (SSA). It is not known how or why this happens. There is no cure or therapy. This project will use transthyretins from human and wallaby to explore a possible cause of SSA. If our hypothesis is correct, we will propose preventative actions to reduce the incidence of SSA in the future.

DP1094535 A/Prof PH Wilson; Prof JP Piek; Prof DA Sugden
Approved Project Title **Development of rapid, online motor control in children**
2010 : \$ 126,000
2011 : \$ 130,000
2012 : \$ 132,000
Primary RFCD 3801 PSYCHOLOGY
Administering Organisation RMIT University

Project Summary

Movement is the primary means by which young children develop understanding of the world. The studies described in this project will provide important insights into the development of movement skill in children and the underlying causes of motor impairment. In particular we aim to understand how thought and action are coordinated in children, supporting the ability to perform more efficient movements. Hence, our work will inform the training and practice of movement educators and physical therapists, transcending some of the myths of clinical theory. This work will have important implications for identifying and training children at risk for motor impairment.

DP1094401 Prof Y Xie; Dr X Huang
Approved Project Title **Topological Optimization of Load-carrying Structural Systems with Repetitive Geometrical Patterns**
2010 : \$ 90,000
2011 : \$ 90,000
2012 : \$ 90,000
Primary RFCD 2908 CIVIL ENGINEERING
Administering Organisation RMIT University

Project Summary

Periodic structures are increasingly used in the design of the structural systems or sub-systems of buildings, bridges, aircraft, motor vehicles etc. The duplication of identical or similar modules significantly reduces the production cost and greatly simplifies the assembly process. In many cases periodic structures are also selected for their distinctive aesthetic appeal. The proposed research will develop advanced techniques for the optimal design of such structures. The new design tool will enable Australian engineers and architects to create innovative and efficient structural systems for a wide range of applications and to become involved in high profile international projects.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094403 Prof Y Xie; Dr X Huang

Approved Project Title **Design of Microstructures for Materials and Composites with Desired Functional Properties**

2010 : \$ 105,000
2011 : \$ 110,000
2012 : \$ 110,000

Primary RFCD 2914 MATERIALS ENGINEERING

Administering Organisation RMIT University

Project Summary

The creation of new and advanced materials and composites will underpin the growth in many industrial and economic activities in Australia. This project will meet the substantial scientific and technological challenges in exploring and finding optimal microstructures for materials and composites with desired functional properties. The proposed research will significantly extend a topological optimization technique known as ESO/BESO - an Australian initiative that has earned a widespread international recognition. Its further development and applications will enable the Australian researchers and engineers to maintain and enhance the national capacity to exploit a niche market in the design of novel materials and composites.