

Summary of Discovery Projects Proposals for Funding to Commence in 2010

Western Australia

Curtin University of Technology

DP1093496 A/Prof F Chan

Approved Project Title **Entropic Analysis of Financial Risk and Uncertainty**

2010 : \$ 87,455

2011 : \$ 82,455

2012 : \$ 82,455

Primary RFCD 3503 BANKING, FINANCE AND INVESTMENT

Administering Organisation Curtin University of Technology

Project Summary

The recent financial crisis has shown that the financial markets are not as stable as expected, and are at risk from a lack of knowledge about new financial products and their risks. This research provides a framework to better measure and forecast financial risks by applying a set of techniques known collectively as entropic analysis as a novel way to measure the amount of information that can be extracted from historical data. The research will facilitate the design of policies and regulations by regulatory authorities that need to evaluate new financial products, their associated risks and their impacts on the financial markets.

DP1094495 Prof CA Curtis; Dr MI Burke; Prof K Mummery; Dr MJ Duncan; Dr C Whitzman; Dr PJ Tranter

Approved Project Title **CATCH: Children, Active Travel, Connectedness and Health**

2010 : \$ 58,000

2011 : \$ 188,000

2012 : \$ 153,000

2013 : \$ 80,000

Primary RFCD 3101 ARCHITECTURE AND URBAN ENVIRONMENT

Administering Organisation Curtin University of Technology

Project Summary

This project will explore built and social environmental influences on children's independent mobility, active travel and health. The research will provide necessary evidentiary support to justify government and development industry policy supportive of healthy and child-friendly environments.

DP1096212 A/Prof TP Dolin

Approved Project Title **Local canons: institutional authority and the category of the literary in Australian secondary-school English syllabuses, 1901-2001**

2010 : \$ 80,000

2011 : \$ 45,000

2012 : \$ 59,000

Primary RFCD 4202 LITERATURE STUDIES

Administering Organisation Curtin University of Technology

Project Summary

Does literature still have a role to play in contemporary Australian culture and society? Is there any national benefit from the study of Shakespeare? Patrick White? Is literary study irrelevant, and out of touch with contemporary culture? These are contentious and important questions. This research, in seeking a deeper and more detailed understanding of the variability of the category of literature in Australian school education over the past century, promises to make an important contribution to long-standing and still vital national and international debates over the canon: debates that tell us a great deal about our region and the world.

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DP1094075 Dr KA Evans; Prof BR Frost

Approved Project Title **Mapping Fluid Flow in the Earth's Crust: a Li and B micro-isotopic and thermodynamic study of serpentinisation**

2010 : \$ 65,000

2011 : \$ 60,000

2012 : \$ 30,000

Primary RFCD 2601 GEOLOGY

Administering Organisation Curtin University of Technology

Project Summary

Interaction of fluids with magnesium-rich rocks creates new minerals and, on a global scale, affects the physical and chemical evolution of the Earth. On a more local scale, such fluid: rock interactions can lock up carbon dioxide via the formation of carbonate minerals. However, the extent to which such reactions may self-propagate is unclear. A primary benefit of this study will be new constraints on the viability of magnesium-rich rocks in geosequestration applications. Additional benefits will be provided by the development of advanced new analytical methodologies, and an increased level of understanding of the way that fluid flow can modify nickel sulphide ore bodies.

DP1096729 Prof K Grice; Dr PF Greenwood; Prof RE Summons; Prof CE Snape

Approved Project Title **Linking modern biolipids and pigments to ancient biomolecules using innovative laser and hydro pyrolysis and compound specific stable isotope techniques**

2010 : \$ 160,000

2011 : \$ 145,000

2012 : \$ 145,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Administering Organisation Curtin University of Technology

Project Summary

This project will help scientists understand recent and past climate changes and in turn will improve our ability to forecast future climate change and help Australia manage current threats to biodiversity. Furthermore, this research involving analyses of discrete trace hydrocarbon materials will increase the ability to identify crude oil sources, to the benefit of petroleum exploration in Australia and world-wide. Importantly, this project will enable students and young researchers to be trained in state-of-the-art technologies, leading to quality scientists ready for employment in geoscience industries, and raising the profile of science careers in Australia.

DP1096232 Prof B Gurevich; Dr M Lebedev; Dr DN Dewhurst; Dr TM Mueller

Approved Project Title **Seismic attenuation and dispersion in reservoir rocks: broad-band experiments versus theoretical modelling**

2010 : \$ 105,000

2011 : \$ 105,000

2012 : \$ 85,000

Primary RFCD 2602 GEOPHYSICS

Administering Organisation Curtin University of Technology

Project Summary

We propose to develop theoretical models of seismic attenuation and dispersion in hydrocarbon reservoirs, and a new method for experimental testing of these models. These models will provide new information to substantially improve characterisation of hydrocarbon reservoirs from geophysical data. The results will help optimise exploration and improve oil and gas recovery through development of new technologies for quantitative reservoir characterisation in Australian basins. This research will enhance Australian competitiveness in basic and applied geophysical research, and will benefit the Australian geophysical industry as a provider of advanced geophysical technologies for oil exploration and production.

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DP1096376 Prof AD Lucey; Prof N Peake; Dr MW Pitman

Approved Project Title **Prediction and control of fluid-structure interactions**

2010 : \$ 85,000

2011 : \$ 87,000

2012 : \$ 90,000

Primary RFCD 2905 MECHANICAL AND INDUSTRIAL ENGINEERING

Administering Organisation Curtin University of Technology

Project Summary

Fluid-flows create a pressure that can deform the surface of a structure or cause it to vibrate; an extreme example is the fluttering of a flag. Flow-induced vibration of the external panels of vehicles causes damage, noise and can adversely affect performance. This project will develop a wholly new approach for the analysis of these interactions. The versatility and completeness of the approach permits a step-change in the design of panels, reducing material and manufacturing costs without compromise to safety and performance - an immense benefit for the myriad engineered products or structures that feature flow over a deformable surface.

DP1097076 A/Prof NA Marks; Dr BP Uberuaga

Approved Project Title **Unique Chemistry from Radioactive Decay in the Solid-State**

2010 : \$ 100,000

2011 : \$ 105,000

2012 : \$ 100,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

Administering Organisation Curtin University of Technology

Project Summary

Australia is an important member of the international nuclear fuel cycle. It holds one-third of the world's uranium reserves and is a major player in the development of technology for immobilizing radioactive waste. We will use computer simulation to answer a very important question which is extremely difficult to study experimentally: How does radioactive decay inside a solid change the chemistry of the material over time? Not only will our study improve nuclear waste storage, it will also reveal how in-situ chemical change creates new kinds of solids which cannot be made by conventional means. These solids can exhibit unusual and useful behaviour; this project provides the first investigation of this unexplored technological niche.

DP1094134 Prof PW Miller; Prof BR Chiswick

Approved Project Title **High-skilled immigrants: Improved methods for enhancing absorption and addressing negative assimilation**

2010 : \$ 143,000

2011 : \$ 146,000

2012 : \$ 148,000

2013 : \$ 100,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation Curtin University of Technology

Project Summary

This project will help Australia to design better migration and immigrant settlement policies. It will provide policy-makers with information on the economic and social adjustment of high-skilled immigrants in a global economy, and hasten the contribution of these immigrants to the development of Australia's technological capabilities. This, in turn, will increase Australia's production opportunities. The research will also help ensure that highly trained researchers are available for acquiring the knowledge that is important in a multicultural society such as Australia, and will further enhance our understanding of our region and the world.

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DP1094499 Dr H Suenaga; Prof HB Bloch

Approved Project Title **Modelling non-linear price dynamics of primary commodities that are affected by seasonality, significant storage costs, and slow adjustment**

2010 : \$ 65,000

2011 : \$ 55,000

2012 : \$ 65,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation Curtin University of Technology

Project Summary

Australia's economy relies substantially on exports of commodities. However, recent volatility of commodity prices has created tremendous uncertainties for traders, producers and consumers of those commodities. This adversely affects our national economy through the disruption of agricultural and mining production, and also more broadly impacts on investment, employment and gross domestic income. This research will model more accurately the complex dynamics of primary commodity prices and their inter-market linkages, which will allow traders, producers and consumers to better forecast commodity price movements and protect themselves through inventory management, hedging and long-run production planning.

DP1093087 Prof KL Teo; Dr B Ling

Approved Project Title **Optimal Control Computation and Analysis of Switched Systems with State and Control Constraints**

2010 : \$ 80,000

2011 : \$ 80,000

2012 : \$ 80,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation Curtin University of Technology

Project Summary

DC/DC converters are widely used in power supply systems and hybrid power systems generate cleaner energy. Achieving optimum performance in these applications has high commercial and environmental impacts. New optimal control problems for such practical problems will be formulated and new unified optimization theory and methods for these optimal control problems will be obtained. The outcomes will enhance Australia's reputation in this cutting edge research, and contribute to achieving optimal performance of high commercial and environmental value applications. It will also facilitate international collaboration, and provide an excellent opportunity for research training.

DP1093233 Prof S Venkatesh; Prof A Jain

Approved Project Title **Surviving the data deluge: Scalable feature extraction, discrimination and analysis for computer vision tasks using compressed sensed data**

2010 : \$ 110,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation Curtin University of Technology

Project Summary

Strategically, our pioneering solutions besides being technically and socially significant, open fresh options for sensor-agnostic data analysis. The technical significance lies through the creation of new technologies for the critical national and global security markets, currently overwhelmed by data. The social significance arises from our solutions being privacy preserving, providing new avenues for the production of novel, socially acceptable products for aged care monitoring. Our methods spearhead future advancement in diverse disciplines due to the wide applicability of the methods to other sensor networks (Square Kilometre Array) and data types, providing new frameworks for addressing crucial problems of data management.