

Summary of Discovery Projects Proposals for Funding to Commence in 2010

South Australia

University of South Australia

DP1096037 Prof P Bordia

Approved Project Title **Understanding employee-employer relationships during bridge employment: A psychological contract perspective**

2010 : \$ 80,000

2011 : \$ 46,000

2012 : \$ 54,000

Primary RFCD 3801 PSYCHOLOGY

Administering Organisation University of South Australia

Project Summary

Bridge employment (paid employment after retirement from a career job) has several advantages for the individual (financial benefits, feeling of social connectedness, sense of accomplishment), employing organisations (access to experienced and skilled workers), and the government (lower burden on pension and benefits schemes). The proposed research will study the employee-employer relationship in bridge employment, with a focus on their perceptions of mutual obligations in form of the psychological contract. An understanding of the psychological contract will make it more likely that the employment relationship fulfils the needs of the employees and employers and leads to a more successful bridge employment relationship.

DP1094571 Dr T Chan; Prof AJ Grant; Prof N Cai; Prof R Yeung; Dr S Ho

Approved Project Title **Robust transmission, identification and key agreement in communications networks**

2010 : \$ 200,000

2011 : \$ 180,000

2012 : \$ 180,000

2013 : \$ 160,000

Primary RFCD 2805 DATA FORMAT

APD Dr S Ho

Administering Organisation University of South Australia

Project Summary

This project identifies significant, innovative directions to achieve robust data transmission, identification and key agreement in networks. It presents the information and communication technology industry with new and profitable markets, contributing to wealth creation, employment and exports. Immediate benefits are: 1. Contribution to the growing knowledge base and fundamental capabilities in networks; 2. Creation and commercialization of valuable intellectual property; 3. Education of future leading academic and industrial innovators within Australia; 4. High international profile of Australian communications and information technology research.

DP1092678 Dr NK Dutta; Prof NR Choudhury; Prof S Holdcroft; Dr C Elvin; Dr AJ Hill

Approved Project Title **Shape Controlled Nanostructured Electrocatalyst for Clean Energy Generation**

2010 : \$ 160,000

2011 : \$ 130,000

2012 : \$ 140,000

Primary RFCD 2599 OTHER CHEMICAL SCIENCES

Administering Organisation University of South Australia

Project Summary

The development of alternative clean energy technology is critical to reduce carbon emissions and global warming. This project will bring significant benefits to the Australian community and economy by addressing these needs by developing highly efficient supported-catalyst, the core issue related to the cost and efficiency of clean electrochemical energy conversion devices. An increase in the catalyst efficiency would translate to significant cost saving and will deliver the nation with a strong intellectual property (IP) position in this frontier area of technology. The fundamental understanding will also underpin the growth in other catalysis areas including sensors, environment pollution and efficient chemical production.

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DP1094869 A/Prof RJ Hattam; A/Prof P Bishop; Prof DP Ahluwalia; A/Prof DM Rigney; Mr SJ Hemming; A/Prof JM Matthews; Dr R Boast

Approved Project Title **Negotiating a space in the nation: the case of Ngarrindjeri**

2010 : \$ 70,000

2011 : \$ 80,000

2012 : \$ 76,000

Primary RFCD 4203 CULTURAL STUDIES

Administering Organisation University of South Australia

Project Summary

This research project aims to investigate a hopeful site for the development of post-apology Indigenous Affairs in the south east of Australia. One such case, is Ngarrindjeri nation and its negotiations with local, State and Federal Government across a complex agenda, including caring for country, community leadership and governance, economic development, a community education strategy, and inter(national) coalition building. The research will contribute to Australian commitments to reconciliation, cultural diversity, intercultural communication and collaboration with Indigenous communities. Importantly, it will also contribute to better management of scarce water resources in the Murray Darling Basin.

DP1094454 Prof RG Horn

Approved Project Title **A new angle on the coalescence of drops**

2010 : \$ 90,000

2011 : \$ 80,000

2012 : \$ 100,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Organisation University of South Australia

Project Summary

Many processes depend on what happens when drops and/or bubbles collide with each other, or with the surfaces of other materials. Examples include inkjet printing, agricultural spraying, spray coating of paints, pharmaceutical formulation, stability of cosmetics and foodstuffs, formation of froths and foams, and flow of bubbly liquids. To control these processes, we need to understand how and why drops sometimes do and sometimes do not coalesce with each other or adhere to surfaces. The knowledge gained in this project will enable improvements to be made in the efficiency of processes such as those listed above.

DP1096551 Prof PG Howlett; Prof CE Pearce

Approved Project Title **Perturbation and approximation methods for linear operators with applications to train control, water resource management and evolution of physical systems**

2010 : \$ 65,000

2011 : \$ 65,000

2012 : \$ 65,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation University of South Australia

Project Summary

Linear equations are used to solve practical problems. In realistic problems the equations and their solutions depend on parameters obtained by measurement of physical quantities and on data derived from observations and experiments. Changes to the values of the key parameters will lead to changes in the solutions. This project will develop methods to better understand the relationships between the key parameters and the solutions and will apply the new insights to practical problems such as the minimization of fuel consumption in trains, optimal resource management in water supply systems and the evolution of physical systems.

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DP1093700 Prof C Kulik

Approved Project Title **Working against type: Stereotype threat effects on mature age workers**

2010 : \$ 85,000

2011 : \$ 80,000

2012 : \$ 60,000

Primary RFGD 3502 BUSINESS AND MANAGEMENT

Administering Organisation University of South Australia

Project Summary

Demographic challenges are creating a new urgency around the management and retention of mature age workers in Australia. The proportion of mature age workers in the population is increasing but labour participation rates are low in the older age categories. This project examines how the demographic composition of workplaces and the content of recruitment advertising evoke negative age stereotypes and lead to the disengagement of mature age workers. The project benefits mature age workers and their employers by identifying organisational policies and practices that counteract these effects by signalling an organisation's commitment to creating an age-friendly environment.

DP1096282 Dr D Losic; Prof LR White; Prof W Guo

Approved Project Title **Periodic nano-ratchets: a new paradigm for biomolecule separation**

2010 : \$ 130,000

2011 : \$ 125,000

2012 : \$ 125,000

Primary RFGD 2504 ANALYTICAL CHEMISTRY

Administering Organisation University of South Australia

Project Summary

This project proposes the theoretical and experimental study of a new separation principle. The platform technologies developed from this research will see wide ranging applications. They will reveal new insights into fundamental phenomena of membranes and separation processes underpinning development of new generation of separation technologies. New membranes and microchip separation devices which can be applied to genomic, proteomic, forensic and a range medical, biotechnological and analytical applications will be readily achievable. This is an international and interdisciplinary research project and its outcomes will enhance Australia's ability in frontier technologies, advanced materials.

DP1093425 Dr MD McDonnell

Approved Project Title **Communication and information storage mechanisms in complex dynamical brain networks**

2010 : \$ 120,000

2011 : \$ 120,000

2012 : \$ 120,000

2013 : \$ 105,000

2014 : \$ 105,000

Primary RFGD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

ARF Dr MD McDonnell

Administering Organisation University of South Australia

Project Summary

Recordings of electrical activity in the brain often cycle repetitively. The aim of this research is to explain how these brain rhythms assist the brain to coordinate simultaneous activity in several regions. Australian socioeconomic benefits include: (i) contributions to the knowledge base of theoretical neuroscience, enhancing Australia's reputation for cutting-edge research; (ii) strengthening of international collaborations with Europe and Japan; (iii) outcomes will ultimately impact on improved medical bionics and future interfaces between brain activity and machines or computers; and (iv) commercialization and technology transfer opportunities, via the transfer of results to biologically inspired engineering.

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DP1094337 Prof J Ralston; Prof S Dietrich; Prof T Kitamori; Dr R Sedev; Dr MN Popescu

Approved Project Title **Energy Dissipation and Nanoscale Processes at Moving Contact Lines**

2010 : \$ 205,000

2011 : \$ 195,000

2012 : \$ 190,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Organisation University of South Australia

Project Summary

The dynamic process of liquids wetting and dewetting, as moving contact lines pass over solid surfaces is central to many industrial operations and natural phenomena. Contact line motion plays a key role in micro and nanofluidics, the foundation of an emergent technology called process intensification, where large industrial processes can be reduced to Lilliputian in size. Substantial energy reduction and other benefits are expected from this project, including the transformation of coarse particle flotation. Young PhD scientists and engineers will be educated in a rich research environment, with strong international research collaboration in areas of national priority.

DP1094428 Prof MA Taylor

Approved Project Title **Dynamic vulnerability of urban road networks**

2010 : \$ 50,000

2011 : \$ 50,000

2012 : \$ 50,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation University of South Australia

Project Summary

Road transport networks are vital to the economic and social health of our society. Poorly performing networks lead to significant costs and adverse environmental and health impacts. This project will develop methods and tools to predict the effects of network failure through incident-related congestion at bottlenecks (e.g. congestion from accidents, vehicle breakdowns, road works, lane blockages and road closures) and to suggest remedial action plans in the case of bottleneck formation. Incident related congestion is responsible for more than 50% of the (\$9.4B p.a.) cost of congestion in Australia's major cities.

DP1096336 Prof BH Thomas

Approved Project Title **Deformable Surfaces Supporting 3D Tactile Human Computer Interactions**

2010 : \$ 75,000

2011 : \$ 75,000

2012 : \$ 75,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Organisation University of South Australia

Project Summary

This project will support Research Priority 3: Frontier Technologies for Building and Transforming Australian Industries. The results will provide information that will further build our understanding of human computer interactions. Digital Foam supports Smart Information Use by providing a new interaction paradigm for existing and new creative applications for digital technologies. The new form of interaction provides a new computer interaction product in itself and the ability to make a more efficient creative environment for designers of 3D content, multi-media and manufacturing design. This technology supports the ability of organisations to operate virtually and collaborate across large distances in Australia and internationally.

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DP1096523 Prof MW Vincent; Prof W Fan

Approved Project Title **Improving Extensible Markup Language (XML) data quality using XML integrity constraints**

2010 : \$ 95,000

2011 : \$ 95,000

2012 : \$ 95,000

Primary RFCD 2801 INFORMATION SYSTEMS

Administering Organisation University of South Australia

Project Summary

The first benefit of the project will be the development of a new technology that will improve the data quality in Australian organizations using the rapidly growing Extensible Markup Language (XML) technology. It will also be of benefit to the Australian software industry, since the outcome of the project is a software tool for cleaning XML data that is aimed at eventual commercialisation in a quickly growing area of the software market. The project will also boost international research collaboration through the involvement of an overseas partner investigator, and expand Australia's expertise in the new area of XML technology through the training of a Ph.D. student.

DP1093275 A/Prof LY Zou; Prof RD Short; Prof Dr H Song; Prof Z Hao

Approved Project Title **Composite conductive electrodes for low energy desalination**

2010 : \$ 63,000

2011 : \$ 65,000

2012 : \$ 63,000

Primary RFCD 2914 MATERIALS ENGINEERING

Administering Organisation University of South Australia

Project Summary

Good quality drinking water supply is a critical issue for water security particularly for inland regional and remote communities, where seawater desalination is not a feasible option. The proposed research has the great potential to develop an alternative, low cost, robust desalination process for brackish water supplies. The superior electrode materials are the key to achieve this goal. The water industry will use the information to assist their decision making for future water supply augmentation in regional communities. High capacity and lower energy forms of desalination are critical to ensuring desalinated water comes at an affordable price for the regional communities.