# Summary of Discovery Projects Proposals for Funding to Commence in 2009

## New South Wales

## University of Wollongong

**DP0986748** Dr SJ Bennett; Dr KA Maton

**Approved Project Title** **Living and Learning in a Knowledge Society: The implications of young adults' knowledge-creating practices for higher education**

**2009 :** $ 40,000
**2010 :** $ 40,000
**Primary RFCD** 3301 EDUCATION STUDIES

**Administering Organisation** University of Wollongong

**Project Summary**

As society moves into a new era, knowledge creation has become vital to Australia's participation in global society. Knowledge creation fuels innovation and economic prosperity, and fosters social cohesion through new forms of community engagement. Young adults play an important role in our society as the next generation of knowledge workers, with many already active knowledge creators in their everyday and academic lives. By investigating how young adults create knowledge across these diverse contexts, this research will provide important practical insights for educators and policy-makers who are trying to determine the role of higher education in a knowledge society.

**DP0986628** Dr SJ Blanksby; Dr TW Mitchell; Dr K Ekroos

**Approved Project Title** **New methods to complete the lipidomics puzzle: revealing the structural diversity of lipids by mass spectrometry**

**2009 :** $ 80,000
**2010 :** $ 55,000
**2011 :** $ 70,000
**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** University of Wollongong

**Project Summary**

Lipid-related disorders such as obesity, diabetes and heart disease are reaching epidemic proportions in the western world. The integration of innovative techniques will provide Australia with unique capabilities to investigate these diseases and place Australia at the forefront of lipid research internationally.

**DP0986738** Dr SJ Blanksby

**Approved Project Title** **New insights into free radical reactivity via gas phase studies of radical anions**

**2009 :** $ 140,000
**2010 :** $ 90,000
**2011 :** $ 90,000
**Primary RFCD** 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

**Administering Organisation** University of Wollongong

**Project Summary**

Free radicals are known to be critical reactive intermediates in chemical processes ranging from the formation of photochemical smog, through combustion to the onset of age-related diseases. This research increases our understanding of how free radicals react and will thus allow for more accurate prediction, and in some instances greater control, of the outcomes of chemical reactions and their health and environmental consequences. New instrumental technologies will be developed and young Australian researchers will be trained here, and with collaborators in the USA, in state-of-the-art techniques (particularly in mass spectrometry) that are essential to our emerging technology-based economy.

**DP0987232** Dr AR Clarke; Prof RJ Barry

**Approved Project Title** **Development of Central Nervous System Functioning in AD/HD: a Longitudinal Study**

**2009 :** $ 80,000
**2010 :** $ 70,000
**2011 :** $ 60,000
**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** University of Wollongong

**Project Summary**

Attention-Deficit/Hyperactivity Disorder (AD/HD) is a debilitating problem affecting 5% of children. AD/HD causes substantial school problems and predisposes the child to drug and alcohol abuse, marital breakdown, criminal prosecution and psychiatric problems in later life. At present we know very little about the underlying causes of the behavioural changes seen in this disorder. This project will clarify the maturational abnormalities in brain function that occur from childhood through to adulthood in this disorder. Better understanding of the normal developmental paths of this disorder will have major clinical benefits as it will allow the development of more optimal treatment plans for these children.

**DP0984797** Prof NE Dixon; Dr T Huber; Dr K Ozawa; Dr M Tehei

**Approved Project Title** **Mapping Protein Contacts and Conformational Changes in Macromolecular Assemblies**

**2009 :** $ 190,000
**2010 :** $ 190,000
**2011 :** $ 190,000
**2012 :** $ 160,000
**2013 :** $ 160,000
**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY
ARF Dr K Ozawa

**Administering Organisation** University of Wollongong

**Project Summary**

We now have a great deal of information about the structures of proteins that interact to do much of the chemistry that governs the lives of cells and organisms, but are just beginning to understand how proteins communicate with each other in the large, dynamic molecular machines that carry out many cellular functions. Australia has invested in expensive instrumentation that can be used in conjunction with new laboratory methods to develop better understanding of how these machines work, and how they malfunction in disease. This project will bring together four scientists with a unique combination of expertise and novel technologies to develop understanding of changes in structure of a large protein complex in different functional states.

**DP0985300** Dr A Dolnik

**Approved Project Title** **From Emergence to Demise: Examining the Dynamic Life Cycle of Terrorist Campaigns**

**2009 :** $ 90,000
**2010 :** $ 85,000
**2011 :** $ 135,000
**2012 :** $ 65,000
**2013 :** $ 85,000
**Primary RFCD** 3602 POLICY AND ADMINISTRATION

**Administering Organisation** University of Wollongong

**Project Summary**

Australia has made a long term commitment to the global campaign against terrorism, under the sound premise that it will take a persistent investment of energy and resources to succeed, and the notion that success in this struggle will be contingent on the depth of our knowledge about the nature of the threat. This project will contribute to this effort by enhancing global understanding of the different stages of the dynamic life cycle of terrorist campaigns, and by formulating empirically based policy recommendations that will move beyond flawed quick-fix solutions, toward the building of a consistent long-term incremental strategy for managing a threat that will never fully disappear.

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**DP0986666** Dr AW Gorman-Murray

**Approved Project Title** **Men on the home front: spatialities of domesticity and masculinity**

**2009 :** $ 90,000
**2010 :** $ 90,000
**2011 :** $ 82,652
**Primary RFCD** 4203 CULTURAL STUDIES
APD Dr AW Gorman-Murray

**Administering Organisation** University of Wollongong

**Project Summary**

This project promotes 'good health and well being for all Australians'. Case studies 1 and 2 investigate the factors underpinning self-reliance and family support in a time of changing household structures. They seek to understand how the domestic lives of men both living alone, and in families, can better contribute to social well-being and wider community interaction and cohesion. Case study 3 focuses on a group of men marginalised from wider society and the care networks servicing the aged community, thus providing knowledge that will improve the mental and physical capacities of older gay men.

**DP0986898** Dr HC Hill; Dr PD Claes; Prof A Johnston

**Approved Project Title** **Face-space: linking three-dimensional shape and human perception across changing viewing conditions.**

**2009 :** $ 80,000
**2010 :** $ 30,000
**2011 :** $ 50,000
**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** University of Wollongong

**Project Summary**

People, and increasingly machines, use faces to identify and interact with people. One source of information available for this is the three-dimensional (3D) shape of the face. This information, unlike a photograph, does not change with lighting and viewpoint. This project will link measurements of face shape to the perceived similarities and differences between faces we use to make decisions. This will facilitate the use of 3D databases in diverse applications including establishing identity, making facial reconstructions of victims of crime or disaster, making databases searchable, computer animation, archaeology, and plastic surgery. In particular the work will make physical databases relevant to human perception.

**DP0985208** Prof JM Hill; Dr BJ Cox

**Approved Project Title** **Mathematical and mechanical models in nano-engineering and nanomedicine**

**2009 :** $ 190,000
**2010 :** $ 130,000
**2011 :** $ 110,000
**2012 :** $ 180,000
**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING
APD Dr BJ Cox

**Administering Organisation** University of Wollongong

**Project Summary**

The major environmental problems generated from global warming and the major human health problems, like cancer and diabetes, if they are to be solved at all, will most likely be resolved making use of advances in nanobiotechnology. This proposal will position Australia as a leader in the modelling of nanodevices such as gigahertz oscillators, nano-electromagnets, nanosensors, nanosyringes and nanoporous media suitable for hydrogen storage and gas separation, which will lead to new technologies and commercial spin-offs that will be of major benefit to this country. The applicants will develop a range of topics in nano-engineering and nanomedicine, training a team that will provide the next generation of researchers in these vital areas.

**DP0985395** Dr C Jones

**Approved Project Title** **Phonological development in child speakers of mixed language**

**2009 :** $ 69,804
**2010 :** $ 69,804
**2011 :** $ 67,612
**2012 :** $ 23,137
**Primary RFCD** 3802 LINGUISTICS

**Administering Organisation** University of Wollongong

**Project Summary**

In Northern Territory Aboriginal communities where traditional languages are mostly spoken fluently by older people, the home language for many children is a kind of mixed language combining elements of traditional languages, Kriol and English. This project will document for the first time the sound system of this language, and investigate how children's background knowledge of this sound system prepares them to learn words in English and traditional languages. This information is important because it can help parents, teachers and speech pathologists assess and teach Aboriginal children from mixed language backgrounds.

**DP0984651** Prof SC Jones; Dr LK Kervin

**Approved Project Title** **Measuring children's responsiveness to food advertising**

**2009 :** $ 60,000
**2010 :** $ 30,000
**2011 :** $ 30,000
**Primary RFCD** 3502 BUSINESS AND MANAGEMENT

**Administering Organisation** University of Wollongong

**Project Summary**

This will be the first study, in Australia or elsewhere, that concurrently examines food promotions across a range of child-targeted media, in real-time, and investigates the way that these commercial messages are attended to, interpreted, and responded to by young people. This project will assist us in developing appropriate regulatory and social marketing responses to non-television advertising to children, will have valuable flow-on effects for measuring the effects of advertising of other types of products, and via other media, and will place Australia at the forefront of research in this area.

**DP0984200** Prof RA Lewis; Dr J Horvat; Dr W Xu

**Approved Project Title** **Better emitters, enhanced optics, superior detectors: advancing terahertz science and technology for applications in medicine, agriculture, industry and national security**

**2009 :** $ 120,000
**2010 :** $ 90,000
**2011 :** $ 90,000
**Primary RFCD** 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

**Administering Organisation** University of Wollongong

**Project Summary**

We will start with a new fundamental study of the interaction of light and matter to explicate the phenomena of the emission, transmission and detection of terahertz electromagnetic radiation. Using our increased understanding of terahertz science, we will then engineer better terahertz sources, optics, and sensors. Better terahertz technology will open up new applications in medical diagnosis, especially dermatology; industrial productivity, such as quality control; and the detection of contraband, including illicit drugs and explosives. In maintaining good health, transforming industries and safeguarding Australia, advanced terahertz systems will bring the nation health, economic and security benefits.

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**DP0985389** Dr LD Nghiem; Prof M Elimelech

**Approved Project Title** **Optimising nanofiltration and reverse osmosis filtration processes for water recycling: effects of fouling and chemical cleaning on trace contaminant removal**

**2009 :** $ 65,000
**2010 :** $ 65,000
**2011 :** $ 65,000
**Primary RFCD** 2906 CHEMICAL ENGINEERING

**Administering Organisation** University of Wollongong

**Project Summary**

In Australia, water recycling is considered a principal measure to manage the current ongoing water shortage and to better protect the environment. Membrane filtration processes play important roles in the treatment of reclaimed municipal wastewater. However, there is very limited knowledge regarding the reliability of such processes in removing trace contaminants from recycled water, which may result in unintended health consequences. This research will lead to a comprehensive understanding of the removal process of such contaminants by membrane filtration. Consequently, the likely avenue of risk can be eliminated and the treatment process can be optimised to achieve economic savings and environmental protection.

**DP0988812** Prof MM Olsson

**Approved Project Title** **Evolutionary biomedicine: genetic pathologies as selection agents in three model systems**

**2009 :** $ 205,000
**2010 :** $ 170,000
**2011 :** $ 170,000
**2012 :** $ 90,000
**2013 :** $ 90,000
**Primary RFCD** 2707 ECOLOGY AND EVOLUTION
APF Prof MM Olsson

**Administering Organisation** University of Wollongong

**Project Summary**

Our environment is changing at a rate never seen before, rendering organisms 'maladapted' if they cannot evolve quickly enough - that is, there will be a mismatch between their genes and the environment in which they evolved. Humans are the most extreme example; maladaptation in modern society elevates risk of cancer, heart disease and psychological disorders (e.g., anxiety probably evolved to help escape predators). I bring together two research areas that aim to explain what causes maladaptation - reproductive medicine and evolutionary biology. Results from this research will help us better understand genetic disease, future health hazards, and predict risk factors of extinction.

**DP0987503** Dr JM Razal

**Approved Project Title** **Wet-Spinning Novel Multi-Functional Bio-Synthetic Platforms**

**2009 :** $ 78,591
**2010 :** $ 78,591
**2011 :** $ 78,591
**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING
APD Dr JM Razal

**Administering Organisation** University of Wollongong

**Project Summary**

The project will deliver new advanced materials for novel biomedical devices such as nanostructured electrodes and tunable drug delivery systems. It will develop a very versatile and low-cost technology that is well-suited for overcoming some of the current limitations in exploiting nanomaterials in nanoscience and biomedical industries. The research will benefit existing biomedical industries in Australia and provide opportunities for new start-up companies, as well as potentially attracting biomedical industries from overseas to establish a presence in Australia.

**DP0984339** Dr AD Sims

**Approved Project Title** **Co-universal operator algebras**

**2009 :** $ 59,000
**2010 :** $ 59,000
**2011 :** $ 68,000
**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** University of Wollongong

**Project Summary**

Australian researchers have established themselves at the very forefront of research into operator algebras associated to graphs. The proposed research will make an important impact, at a fundamental level, on the way that researchers around the world view these operator algebras. This will help to further strengthen Australia's reputation in this field. The proposed program will also train two PhD students in a very active area of mathematics and put them in contact with a vibrant research community. This will help contribute to the strong future of pure mathematics in Australia.

**DP0987164** Dr K Szabo

**Approved Project Title** **The cutting edge: Investigating the use of shell as a raw material by Australasian hominins**

**2009 :** $ 132,701
**2010 :** $ 127,000
**2011 :** $ 163,119
**2012 :** $ 117,220
**2013 :** $ 120,769
**Primary RFCD** 4302 ARCHAEOLOGY AND PREHISTORY
QEII Dr K Szabo

**Administering Organisation** University of Wollongong

**Project Summary**

Australasia has tended to exist on the periphery of major debates surrounding human evolution. There is little justification why this should be the case, and Australasia has much to contribute with insights into adaptations to island and tropical environments, and the use of novel raw materials for artefact production. Such enquiries not only help us understand the place of early Australasians within a global framework, but assist us in understanding the unique challenges and opportunities afforded by this region. The regional and European research linkages developed and enhanced by this project ensure that such knowledge is not only 'owned' by Australasians, but is incorporated into global thinking.

**DP0986041** A/Prof G Waitt; A/Prof CR Gibson; Dr NJ Gill; Prof LM Head

**Approved Project Title** **Making less space for carbon: cultural research for climate change mitigation and adaptation**

**2009 :** $ 69,984
**2010 :** $ 114,000
**2011 :** $ 120,000
**2012 :** $ 100,000
**Primary RFCD** 4203 CULTURAL STUDIES

**Administering Organisation** University of Wollongong

**Project Summary**

The project meets the pressing need for a national response to climate change. The National Climate Change Adaptation Framework identifies a number of cultural changes needed within the next five years to adapt to existing climate change. Profound cultural transformations are also urgently needed to mitigate future change by reducing greenhouse gas emissions. The true national benefit of this work should be assessed in terms of the costs of not funding it. Australia's capacity to adapt will only ever be partial without the new and fundamental insights provided by cultural geographic research.

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**DP0988700** Prof MJ Walker; Dr JA Aquilina

**Approved Project Title** **Mapping cell wall and surface structures of Gram-positive cocci**

**2009 :** $ 90,000
**2010 :** $ 40,000
**2011 :** $ 40,000
**Primary RFCD** 2703 MICROBIOLOGY

**Administering Organisation** University of Wollongong

**Project Summary**

The synthesis of the Gram-positive cell wall and protein transport are fundamental processes, the improved understanding of which will impact across a range of fields including microbiology, biochemistry and biotechnology, and the application and manipulation of Gram-positive bacteria in agriculture, industry and human health. In the long-term, the analysis of the Gram-positive ExPortal and cell wall will identify proteins that may represent targets for therapeutic intervention. Additionally a precise understanding of the mechanisms of secretion of anchorless proteins will have an important impact in the biotechnology field, as new methodologies for the secretion of recombinant proteins of industrial value is a potential outcome.

**DP0987344** Prof GG Wallace; Dr SE Moulton; Prof MJ Cook

**Approved Project Title** **Novel Drug Delivery Systems**

**2009 :** $ 280,000
**2010 :** $ 180,000
**2011 :** $ 180,000
**2012 :** $ 300,000
**2013 :** $ 280,000
**Primary RFCD** 2915 BIOMEDICAL ENGINEERING
QEII Dr SE Moulton

**Administering Organisation** University of Wollongong

**Project Summary**

The polymer based structures targeted for production in this project will bring unique capabilities to the field of drug delivery. A multi-drug delivery platform is expected to bring significant improvements in administering therapeutic drugs for a wide range of illnesses and applications. This will have profound effects on the quality of life for those suffering from epilepsy or requiring stent implants. Here we will demonstrate the capabilities of these novel polymer structures both in-vitro and in-vivo.

**DP0987805** Dr JZ Wang

**Approved Project Title** **Development of inorganic-conducting polymer composites and ionic liquid-based electrolytes for rechargeable lithium batteries**

**2009 :** $ 110,000
**2010 :** $ 110,000
**2011 :** $ 110,000
**Primary RFCD** 2914 MATERIALS ENGINEERING

**Administering Organisation** University of Wollongong

**Project Summary**

The project will lead to development of safe lithium batteries for electric vehicles and hybrid electric vehicles to contribute to the national priority goal of reducing and capturing emissions in transport to improve our environment. Small, flexible batteries for new implantable medical devices will also be developed to treat millions of people suffering from different diseases. The development of new scientific knowledge related to this project will place Australia at the forefront of an emerging domain of research. The project will take the incentive in establishing a leading national position in development of new energy storage technology.

**DP0987190** A/Prof X Wang; Dr Z Cheng; Mr D Chen; Prof T Kimura; Dr F Klose

**Approved Project Title** **Frustrated magnets: a new platform for multiferroic materials**

**2009 :** $ 160,000
**2010 :** $ 115,000
**2011 :** $ 115,000
**Primary RFCD** 2914 MATERIALS ENGINEERING
APD Mr D Chen

**Administering Organisation** University of Wollongong

**Project Summary**

Ferroelectric materials with simultaneous ferroelectricity and ferromagnetism are one of the most important new emerging fields in the materials science and condensed matter physics communities. Novel magneto-electronic devices based on new multiferroic materials will open up a huge market for these devices, which are expected to have a huge impact on modern science and daily life. The purpose of this project is to make Australia one of the leading countries in this field and to work with colleagues inside Australia and around the world to move this field forward for mutual benefit.

**DP0984341** Prof MR Wilson; Prof CM Dobson; Dr JR Kumita; Mr JJ Yerbury

**Approved Project Title** **Establishing the role of alpha-2-macroglobulin in quality control of extracellular protein folding**

**2009 :** $ 125,000
**2010 :** $ 80,000
**2011 :** $ 80,000
**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY
APD Mr JJ Yerbury

**Administering Organisation** University of Wollongong

**Project Summary**

The expected outcomes will provide important advances in understanding the role of alpha-2-macroglobulin (A2M) in maintaining the normal structure/function of extracellular proteins. This information may ultimately aid in the design of agents to be used to clear the body of pathological protein aggregates - potentially providing a direct economic benefit to Australia. The high novelty and broad significance of this work indicate that it will produce high-impact publications which will tangibly assist Australia being recognized as a major contributor to world research outcomes. This project will also provide a direct social benefit by training research students with the skills necessary to further the development of biological research in Australia.