

## South Australia

### The University of Adelaide

**DP0985176** Prof AD Abell; Mr J Yu

**Approved Project Title** **Electron transfer in proteins, a study of mechanism and function**

**2009 :** \$ 150,000

**2010 :** \$ 100,000

**2011 :** \$ 100,000

**Primary RFCD** 2503 ORGANIC CHEMISTRY

APD Mr J Yu

**Administering Organisation** The University of Adelaide

#### Project Summary

Our research will probe the mechanisms by which nature's living systems build, maintain, and reproduce. We present an ability to understand these processes at a detailed molecular level using science and technology at the forefront of multidisciplinary research. The research will provide a foundation for new smart materials, technologies and future industries, and also ways forward for future basic scientific research and endeavor. All this is done with the best international researchers and capabilities within a local environment that will help to train the next generation of Australian scientists.

**DP0984593** A/Prof S Akkach

**Approved Project Title** **Islam and Secular Urban Culture in Early Modern Middle East**

**2009 :** \$ 99,000

**2010 :** \$ 88,000

**2011 :** \$ 119,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Organisation** The University of Adelaide

#### Project Summary

Australia is the homeland of a growing Muslim community, and Islam is an important feature in Australia's religious and cultural landscape. The project contributes to expanding Australia's knowledge of Islam, to developing its ability to engage and interact in constructive and enabling ways with the Muslim communities locally, regionally, and internationally, and to heightening the Muslims' respect for the modern secular culture by making them aware of their creative role in its making. It addresses a prevailing misunderstanding about secular culture in Islam and enhances Australia's international reputation as a centre of cutting-edge research in the fields of Islamic studies.

**DP0986683** Dr RS Brinkworth; Dr K Nordstrom

**Approved Project Title** **Understanding and Modelling Insect Motion Vision**

**2009 :** \$ 120,000

**2010 :** \$ 90,000

**2011 :** \$ 90,000

**Primary RFCD** 3207 NEUROSCIENCES

**Administering Organisation** The University of Adelaide

#### Project Summary

The interdisciplinary project proposed will offer a stimulating environment for research/training into computational neuroscience, an attractive area for aspiring scientists. We have already demonstrated the feasibility of transferring physiology into applications, and expect this project to deliver functional motion vision models and devices. Our proposed work will have an impact beyond the advancement of neuro-physiology as knowledge gained is applicable in a range of areas, with applications in miniature unmanned vehicles and collision avoidance detectors in defence and civilian roles. Our project could also assist in the development of artificial intelligence and as a basis for designing implantable artificial eyes.

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

**DP0988863** Prof A Cooper; Dr KP Aplin; Prof SC Donnellan

**Approved Project Title** **Phylogeography, evolution and taxonomy of humanity's greatest pest, Rattus rattus: Epidemiological, archaeological and conservation implications**

**2009 :** \$ 130,000

**2010 :** \$ 130,000

**2011 :** \$ 130,000

**Primary RFCD** 2705 ZOOLOGY

**Administering Organisation** The University of Adelaide

### Project Summary

This project will characterise a major threat to Australian biosecurity and health, and identify the range of likely disease risks associated with introductions of different 'strains' of black rat. It will provide critical data for management efforts around the world, especially for strategic partners in neighbouring Southeast Asian nations, as well as for conservation efforts within Australia. The data will also provide novel means to track the timing and routes of human prehistoric movements throughout the area. It will establish strategic research collaborations between researchers in zoological, medical, epidemiological, genetics, and conservation fields in a unique multi-disciplinary study.

**DP0988276** A/Prof J Denier; Prof AP Bassom

**Approved Project Title** **A novel approach to controlling boundary-layer separation**

**2009 :** \$ 60,000

**2010 :** \$ 60,000

**2011 :** \$ 60,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of Adelaide

### Project Summary

This project will involve fundamental research into the control of the fluid dynamical phenomena of boundary-layer separation and transition to turbulence. The project will be built upon a firm foundation of mathematical modelling of the complex behaviour of fluid flows that are near the onset of flow separation or turbulence. The project will produce results that will permit the development of control strategies that can be implemented in a wide variety of important technological applications, such as drag reduction in the aerospace and ship industries as well as the control of stall (or loss of lift) in modern aircraft.

**DP0988673** Dr BM Fischer; Dr BS Ferguson; Prof D Abbott

**Approved Project Title** **Breaking The Wavelength Barrier: Near-Field T-ray Imaging**

**2009 :** \$ 135,000

**2010 :** \$ 135,000

**2011 :** \$ 135,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Organisation** The University of Adelaide

### Project Summary

Australia will benefit from the interaction between engineering, physics, and biology to develop a new T-ray imaging system that will ultimately be able to probe microstructures, biological single cells or even neurons. The project will exploit a powerful new electrooptical technique for obtaining chemical 'fingerprints' at the cellular level. This breakthrough will be a fundamental step towards a system for probing disease states of single cells and will open up new lines of scientific enquiry. Ultimately, Australia will benefit from a new technology and new diagnostic biomedical techniques. This is potentially an enabling technology for future customised medicine, where rapid biochip sensing becomes foreseeable.

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

**DP0985378** Dr CM Ford; Prof DK Taylor; Dr MR Thomas; Dr PK Boss  
**Approved Project Title** **Metabolite glucosylation during grape berry development**  
**2009 :** \$ 100,000  
**Primary RFCD** 3003 HORTICULTURE  
**Administering Organisation** The University of Adelaide

### Project Summary

The research proposed contributes to building and transforming the Australian wine industry, and other horticultural industries, by developing expertise and knowledge in the area of grape berry metabolism. The synthesis and validation of a library of grape berry metabolites, annotation of part of the grapevine genome sequence dataset and development of the micro vine transformation system are innovative products of significant national and international benefit. Two high-quality PhD students will be trained in a collaborative and high-quality research environment during the course of the proposed research.

**DP0988514** Dr P Gerrans; Dr J Hohwy  
**Approved Project Title** **A model of the mind which explains the role of emotions in normal cognition and affective disorder**  
**2009 :** \$ 56,000  
**2010 :** \$ 36,000  
**2011 :** \$ 71,000  
**Primary RFCD** 4401 PHILOSOPHY  
**Administering Organisation** The University of Adelaide

### Project Summary

Depression is recognised as one of the most burdensome diseases in Australia. Though we of course make no claims, as philosophers, to cure depression our contribution is to engage philosophy productively with a vital national area of empirical research. The other area of national benefit is to consolidate Australia's developing reputation as a site for the involvement of philosophy in interdisciplinary projects which link the humanities to the sciences. Furthermore, with the project's anchoring in the humanities, there is hope that a focus on, and increased understanding of, depression will have flow-on effects in the Australian community that will help ease the stigmatisation that is still felt by many of its sufferers.

**DP0985807** Dr HH Harris; Dr PK Witting; Dr GI Giles  
**Approved Project Title** **The fate of dietary selenium in vivo; a direct approach to linking chemical form with biological activity.**  
**2009 :** \$ 200,000  
**2010 :** \$ 150,000  
**2011 :** \$ 150,000  
**2012 :** \$ 155,000  
**2013 :** \$ 155,000  
**Primary RFCD** 2502 INORGANIC CHEMISTRY  
QEII Dr HH Harris  
**Administering Organisation** The University of Adelaide

### Project Summary

Dietary selenium supplementation has great potential as a preventative treatment for a range of human health conditions, including cancer, that widely affect the Australian population. However, the adverse effects of such treatments are not fully recognised. This project will increase our knowledge of how selenium compounds are stored and utilised in the body and relate the information to clinical observations regarding dietary intake of selenium and other compounds. The new understanding generated will delineate the conditions for safe intake, so that the beneficial effects associated with selenium supplementation may be harnessed more effectively.

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

**DP0985074** A/Prof LE Hill  
**Approved** **Is Compulsory Voting Defensible?**  
**Project Title**  
**2009 :** \$ 30,000  
**2010 :** \$ 31,000  
**Primary RFCD** 3601 POLITICAL SCIENCE  
**Administering Organisation** The University of Adelaide

### Project Summary

If it can be demonstrated that, under the right conditions, compulsory voting is an acceptable solution to the escalating problem of declining turnout in industrialised, voluntary-voting systems, then the Australian regime will provide the ideal starting point from which to produce guidelines for the successful adoption and management of compulsory voting. Since Australia has, arguably, the best managed and tolerated compulsory voting regime in the world, the project has potentially enormous national significance in terms of publicising, promoting and exporting our electoral expertise. The project will also position Australian scholarship at the forefront of rapidly expanding global interest in the practice.

**DP0985877** Prof PC Jain  
**Approved** **Network Diplomacy: Japan's Strategic Responses to the Rise of China and India**  
**Project Title**  
**2009 :** \$ 34,000  
**2010 :** \$ 34,000  
**2011 :** \$ 35,000  
**Primary RFCD** 3699 OTHER POLICY AND POLITICAL SCIENCE  
**Administering Organisation** The University of Adelaide

### Project Summary

Japan's evolving strategic and economic ties with Asia's rising giants, China and India, alongside military and defence ties with the US, shape the region where Australia's economic and strategic interests are embedded. This project benefits Australia by enhancing Australian knowledge of Japan's involvement in the transformation of relations between Asia's major powers (all crucial to Australian interests) so Australia can maximise opportunities and minimise national costs. Importantly, this research also involves Australia in the production of new understandings about regional geo-strategic transformation, in order to contribute to a new international relations paradigm.

**DP0985708** Dr RT Jeffery  
**Approved** **Forgiveness in conflict resolution and peacebuilding: international dimensions**  
**Project Title**  
**2009 :** \$ 43,000  
**2010 :** \$ 34,000  
**2011 :** \$ 46,000  
**Primary RFCD** 3601 POLITICAL SCIENCE  
**Administering Organisation** The University of Adelaide

### Project Summary

In an age in which ongoing conflicts and tensions have very real ramifications for international and regional security, finding new and more effective ways to resolve international disputes is critical to ensuring Australia's ongoing security. This project will therefore benefit Australia by 'enhancing our nation's understanding of social, political, and cultural issues' associated with the resolution of conflict in the Asia Pacific region. By helping to develop an alternative peacebuilding tool, it will also assist those engaged in the practical delivery of peacebuilding initiatives in the region.

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

**DP0988941** Prof DB Leinweber; Dr LJ von Smekal; Prof AG Williams

**Approved Project Title** **Strong Interaction Physics from Lattice QCD**

**2009 :** \$ 204,000

**2010 :** \$ 175,000

**2011 :** \$ 177,000

**Primary RFCD** 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

**Administering Organisation** The University of Adelaide

### Project Summary

This project will significantly advance our knowledge of the subatomic structure of the universe. It will maintain excellence and strength in an area where Australia has built an outstanding international reputation over the past decade. It will place Australia at the cutting edge of fundamental and computational science research and it will maintain and grow strong international links. It will produce Australian graduates and research associates of high quality, who will benefit from participating in these state-of-the-art studies and from the advanced training in modeling, high-performance computer simulation and visualisation. This training will have major economic benefits for and provide strong links to Australian industry.

**DP0984717** Dr P Marschner; Prof RG Burns; Dr P Rengasamy; Dr J Schimel

**Approved Project Title** **How are microorganisms and nutrient cycling in saline soils affected by soil matrix potential?**

**2009 :** \$ 80,000

**2010 :** \$ 65,000

**2011 :** \$ 65,000

**Primary RFCD** 3001 SOIL AND WATER SCIENCES

**Administering Organisation** The University of Adelaide

### Project Summary

Dryland agriculture is threatened by salinity and drought, and it is well-known that individually, both can decrease not only crop growth but also microbial activity and nutrient cycling which are critical for sustainability. As our climate becomes drier, it is necessary to understand how microbial activity and nutrient cycling in saline soils will be affected by drought and sporadic summer rainfall events. As an international team of soil biologists, we will investigate the interactions between salinity and soil moisture on microbial activity and nutrient cycling. The results will provide insights into nutrient cycling in saline soils now and in the future and the benefit of amelioration strategies.

**DP0985723** Prof Z Michalewicz

**Approved Project Title** **The Next Step in Intelligent Decision-Support Systems (IDSS): Systems that Learn and Adapt**

**2009 :** \$ 91,000

**2010 :** \$ 94,000

**2011 :** \$ 96,000

**Primary RFCD** 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

**Administering Organisation** The University of Adelaide

### Project Summary

This project will benefit Australia's scientific knowledge and technology base in the areas of evolutionary computation, business intelligence, and decision management. The outcomes will advance Australian companies and organisations, as many common yet complex business problems can be better addressed with systems that automatically learn and adapt to environmental changes. Such complex business problems include dynamic scheduling (in the manufacturing sector), resource allocation optimisation (in the defence, mining, and agriculture sectors), and network design optimisation (in the telecommunications and energy sectors).

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

**DP0987056** Prof TM Monro; Dr H Ebendorff-Heidepriem; Dr S Madden; Prof KA Richardson; Prof W Margulis

**Approved Project Title** **A new platform for poled glass waveguides in the mid-infrared**

**2009 :** \$ 220,000

**2010 :** \$ 200,000

**2011 :** \$ 190,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of Adelaide

### Project Summary

Mid-infrared light (beyond red out to what we feel as radiant heat) underpins many crucial applications that include the remote detection of explosives, chemicals and biological agents; dramatically speeding up internet communications; and even helping us detect planets in distant solar systems. The enormous cost of generating and analysing mid-infrared light using current technology has prevented many of these life-changing applications coming to fruition. This project aims to change this and deliver technological leadership in this crucial field to Australia, thereby generating significant social and economic benefits. This project will also enhance Australia's international links and build on a range of national research programs.

**DP0985828** Prof DJ Oehlers; A/Prof MC Griffith; Dr MS Mohamed Ali

**Approved Project Title** **A unified reinforced concrete model for flexure and shear**

**2009 :** \$ 120,000

**2010 :** \$ 130,000

**2011 :** \$ 150,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of Adelaide

### Project Summary

The catastrophic Minnesota River Bridge collapse in the USA in 2007 highlighted the importance of accurately assessing, maintaining, upgrading and prolonging the design life of our aging infrastructure. The problem, which is just as severe in Australia, is further exacerbated by increasing man-made (terrorist) hazards and natural hazards such as earthquake, tsunami, flood and bushfire. Reinforced concrete and composite steel-concrete structures comprise a very large part of Australia's bridge and building infrastructure. This project will provide a safe and more economical tool for engineers to both extend the working-life of existing infrastructure and design new infrastructure.

**DP0986882** A/Prof SA Robertson; Dr RB Gilchrist

**Approved Project Title** **Molecular mechanisms for seminal fluid signalling in reproduction**

**2009 :** \$ 170,000

**2010 :** \$ 150,000

**2011 :** \$ 150,000

**Primary RFCD** 3210 CLINICAL SCIENCES

**Administering Organisation** The University of Adelaide

### Project Summary

Male seminal fluid regulation of the female reproductive process influences fertility and fecundity in humans and animal species. Infertility and impaired reproductive function is a major economic constraint in livestock industries, and carries a substantial social and public health cost in humans. This research will identify the active signalling molecules in seminal fluid and quantify their importance in reproductive success and health of offspring. The outcomes will inform development of new diagnostic assays for male fertility, and underpin strategic design of novel fertility treatments and products with applications in the human health and animal breeding industries.

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

**DP0985063** A/Prof M Roughan; Prof H Shen  
**Approved Project Title** **Network Management in a World of Secrets**  
**2009 :** \$ 110,000  
**2010 :** \$ 95,000  
**2011 :** \$ 110,000  
**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES  
**Administering Organisation** The University of Adelaide

### Project Summary

The aim of this proposal is to provide world leading measurement and management techniques for the Internet and other telecommunications networks. In particular, the methods will improve privacy of network participants (customers and providers) while simultaneously improving network performance. Additionally, the project will create expertise in an area of great future interest -- privacy preserving computation -- expertise that can be transferred to students and the next generation of innovators.

Apart from these benefits, the research will provide exposure of Australian research strength in an area of world-wide public interest. Results concerning Internet reliability are of particularly high impact.

**DP0987620** Dr K Sanders; Dr MS Lee  
**Approved Project Title** **Sea Snake Diversification: Why Are Certain Taxa And Regions Species-Rich?**  
**2009 :** \$ 86,000  
**2010 :** \$ 75,000  
**2011 :** \$ 70,000  
**2012 :** \$ 58,943  
**Primary RFCD** 2705 ZOOLOGY  
APD Dr K Sanders  
**Administering Organisation** The University of Adelaide

### Project Summary

By generating new knowledge of ecologically and medically important Australasian organisms, this project will benefit biodiversity management, snakebite therapy and pharmaceutical research. Sea snakes reach peak diversity in the Indo-Australian hotspot and are threatened by habitat degradation, fisheries bycatch and rising sea temperatures. Sea snake conservation and marine reserve management strategies will directly benefit from a better understanding of local endemism, species boundaries and possible cryptic species. Sea snakes are highly venomous and pose a significant health risk in fishing communities; venom variation has a strong phylogenetic component and is of vital importance in antivenom preparation and bioprospecting.

**DP0988263** Dr K Selway  
**Approved Project Title** **Resistivity of typical rocks at crustal pressure and temperature conditions from combined laboratory and magnetotelluric measurements**  
**2009 :** \$ 130,000  
**2010 :** \$ 120,000  
**2011 :** \$ 88,000  
**Primary RFCD** 2602 GEOPHYSICS  
APD Dr K Selway  
**Administering Organisation** The University of Adelaide

### Project Summary

Magnetotelluric surveys are playing an increasing role in Australian geoscience, including academic research, data collected by geological surveys (including a role in Geoscience Australia's \$58.9 million Onshore Energy and Security Program), mineral exploration and geothermal exploration. This project will enable the results of these surveys to be interpreted more accurately and meaningfully by constraining the expected resistivities of crustal rocks at various pressures and temperatures. This research is vital if the investment currently being put into MT surveys is to be capitalized upon.

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

**DP0986973** Prof JN Timmis; Dr MA Ayliffe

**Approved Project Title** **Endosymbiotic DNA transfer**

**2009 :** \$ 125,000

**2010 :** \$ 95,000

**2011 :** \$ 95,000

**Primary RFCD** 2702 GENETICS

**Administering Organisation** The University of Adelaide

### Project Summary

Interorganellar DNA movement is a major force in evolution. In higher organisms, the prokaryotic ancestors of mitochondria and chloroplasts donated many genes to the nucleus. Plants have unique potential in studies of the mechanisms that have driven genome evolution. We established experimentally that DNA moves from the chloroplast to the nucleus at high frequency and this provided us with a world lead in this scientifically new area. The relocated genes contribute to the number and diversity of genes and gene function. Genetically manipulated (GM) crops use the chloroplast compartment to make high levels of protein, necessitating a full understanding of how transgenes behave within the cellular and the external environment.

**DP0988439** A/Prof AJ van den Hengel; Dr AR Dick

**Approved Project Title** **Combined shape and appearance descriptors for visual object recognition**

**2009 :** \$ 80,000

**2010 :** \$ 60,000

**2011 :** \$ 60,000

**Primary RFCD** 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

**Administering Organisation** The University of Adelaide

### Project Summary

The quantity of video generated each year is expanding rapidly. This increasing volume of visual information means that it is more likely that any particular event will be recorded, but that the footage will be harder to find. This applies to a collection of home videos as much as to television and movie footage. The object-recognition method to be developed has the potential to alleviate this situation, in which vast amounts of video data are available but have little value. Such an outcome would be a boon for Australian industry and offer a valuable export opportunity.

**DP0988153** Prof JC Wallace; A/Prof PV Attwood

**Approved Project Title** **New Insights into the Structure and Function of Pyruvate Carboxylase**

**2009 :** \$ 110,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Organisation** The University of Adelaide

### Project Summary

Pyruvate carboxylase plays an essential roles in insulin secretion by pancreatic islets and in normal brain function, but excess expression of this enzyme in liver and adipose tissue is associated with diabetes and obesity.

Understanding the function of each structural feature in the reaction mechanism of an enzyme is essential to designing safe and effective pharmaceuticals that are required to modulate its activity.

This project, which will use cutting edge techniques in an experimental model, seeks to characterise this important enzyme's function so that better treatments can be developed in future for diabetes and obesity.

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

**DP0988064** Mrs X Yin

**Approved Project Title** Investigation of three dimensional terahertz computed tomography for biomedical applications

**2009 :** \$ 85,000

**2010 :** \$ 80,000

**2011 :** \$ 80,000

**Primary RFCD** 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

APD Mrs X Yin

**Administering Organisation** The University of Adelaide

### Project Summary

Terahertz (T-ray) imaging is an exciting newly emerging technology that can perform safe, non-invasive, imaging and chemical sensing at the same time. This research aims to achieve an advance in terahertz imaging by using advanced methods that will enhance our ability to achieve accurate detection of diseased tissue in vivo.

Socio-economic benefits to Australia include: (i) contributions to terahertz systems, enhancing Australia's reputation for cutting-edge research; (ii) international collaboration will be strengthened; (iii) results will potentially lead to commercialisation opportunities; (iv) the outcomes will ultimately impact on improving terahertz imaging in quality control, medical diagnosis, and detection for national security.