

Summary of Discovery Projects Proposals for Funding to Commence in 2010

South Australia

The University of Adelaide

DP1097281 Prof D Abbott; Dr SP Mickan

Approved Project Title **Fibre sensors with subwavelength features in the Terahertz radiation (T-ray) regime**

2010 : \$ 145,000

2011 : \$ 150,000

2012 : \$ 140,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

Administering Organisation The University of Adelaide

Project Summary

With this program, Australia will benefit from expertise in photonics that will develop new chemical biosensors based on optical fibre technology. The novelty is that the fibres will be used to guide Terahertz radiation (T-ray) frequencies that will be able to detect very small samples of material or fluid. This is a fundamental step towards a system that will impact on applications in the medical, pharmaceutical, forensic, and security industries. Ultimately, Australia will benefit from a new cutting-edge technology and a new diagnostic biosensing technique.

DP1094299 Prof P Bedrikovetsky; Dr Y Cinar; Dr AG Kotooussov; A/Prof A Shapiro; Prof Dr A Polyinin; Prof EH Stenby

Approved Project Title **Modelling the capillary entrapment phenomena and integrity of geological reservoirs for clean energy, water and waste management technologies**

2010 : \$ 105,000

2011 : \$ 105,000

2012 : \$ 100,000

Primary RFCD 2911 ENVIRONMENTAL ENGINEERING

Administering Organisation The University of Adelaide

Project Summary

This project will improve our understanding of non-linear flow and fracture phenomena in porous media which is prerequisite for the development of new emerging technologies targeting the reduction of the greenhouse gas emission and development of effective waste and water management solutions including coal gasification, in-situ storage of natural and non-hydrocarbon gases, underground disposal of hazardous wastes and vadose zone remediation. The project will result in a dramatic improvement of the predictive tools for traditional ground water management, irrigation and petroleum recovery applications. It has the strength to place Australia in the forefront of these technologies.

DP1094764 Dr AR Dick; Dr H Detmold; Prof P Torr

Approved Project Title **Tracking targets in large scale surveillance camera networks**

2010 : \$ 65,000

2011 : \$ 65,000

2012 : \$ 65,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Adelaide

Project Summary

The research is expected to provide a significant boost in the effectiveness of safety and security measures for public facilities and open spaces that are monitored by surveillance cameras. The general public benefits from this through a decreased need for intrusive security measures, and increased deterrence of crime and anti-social behaviour. This capability is in demand worldwide for both public and private camera networks, whose usefulness is currently limited by the difficulty of monitoring them. We therefore anticipate considerable commercial interest in Australia and internationally.

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DP1094015 Dr C Doolan; Prof CH Hansen; Dr S Koziel; Prof L Davidson; Dr D Feszty

Approved Project Title **The mechanics of quiet airfoils**

2010 : \$ 100,000

2011 : \$ 90,000

2012 : \$ 90,000

Primary RFCD 2902 AEROSPACE ENGINEERING

Administering Organisation The University of Adelaide

Project Summary

Airfoil trailing edge noise affects many technologies, from wind turbines to computer cooling fans and must be reduced to improve productivity, public health and the environment. This project aims to develop a new class of quiet airfoil design and an active trailing edge noise control system to help solve this important problem. This research will provide multiple, long terms benefits to Australia that include reduced greenhouse gas emissions, reduced airport noise, new high technology products for export, and improved public health.

DP1096427 Dr DA Fordham; Prof BW Brook

Approved Project Title **Range dynamics and demographics of spatially structured populations under global change**

2010 : \$ 130,000

2011 : \$ 130,000

2012 : \$ 130,000

Primary RFCD 2799 OTHER BIOLOGICAL SCIENCES

Administering Organisation The University of Adelaide

Project Summary

Why are particular species present in some locations, but not others? This is a simple, fundamental ecological question, yet surprisingly, our answers on this point remain far from complete. Using an integrated, systems-based approach, we will determine the interplay between: (i) birth, death and movement rates, (ii) species interactions, and (iii) the constraints of the physical environment (temperature, rainfall, soil type), which determine the limits of species' ranges. Our models will provide Australian conservation managers with a novel, validated toolbox to explore the trade-offs, and synergies, inherent in trying to adapt to climate change and other stressors on biodiversity.

DP1096374 Prof J Gao

Approved Project Title **New estimation and testing issues in nonlinear time series econometrics**

2010 : \$ 130,000

2011 : \$ 150,000

2012 : \$ 130,000

2013 : \$ 110,000

2014 : \$ 130,000

Primary RFCD 3404 ECONOMETRICS

APF Prof J Gao

Administering Organisation The University of Adelaide

Project Summary

The outcomes of this project will not only complement but also enhance the existing strengths of Australian researchers in the field of econometrics. The outcomes are also expected to help stabilise the national financial market for more accurate forecasts. It is also expected that the outcomes will provide novel models to respond to climate change and variability and to provide accurate warming estimates for improving the policy making process.

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DP1095782 Dr W Haak; Dr B Llamas; Dr L Quintana-Murci; Prof AL Hughes

Approved Project Title **A shipload of consequences: studying the impact of Old World diseases on native South American populations via ancient DNA**

2010 : \$ 120,000
2011 : \$ 120,000
2012 : \$ 120,000

Primary RFCD 3202 IMMUNOLOGY
APD Dr B Llamas

Administering Organisation The University of Adelaide

Project Summary

This pioneering project will give the first real-time picture of the genetic changes induced by epidemics in human populations. This will reveal important new information about the likely impact of future epidemics on the genetic diversity of the immune system in modern human populations and will be of substantial use in building epidemiological models. By proposing to combine state-of-the-art science with global problems of humanity, we will address Australia's interests in expanding scientific expertise beyond its borders and place Australia at the leading edge of disease impact studies.

DP1093110 A/Prof GS Heinson

Approved Project Title **Three-dimensional magnetotelluric and controlled-source electromagnetic modelling and inversion in isotropic and anisotropic media with Gaussian Quadrature Grids**

2010 : \$ 112,000
2011 : \$ 115,000
2012 : \$ 115,000

Primary RFCD 2602 GEOPHYSICS
Administering Organisation The University of Adelaide

Project Summary

Electromagnetic methods are widely used by geophysicists in many applications, including mineral, petroleum and geothermal exploration, environmental and groundwater characterisation, and in imaging of Earth and other planets. Large data-sets are routinely collected, but to interpret these carefully we need efficient computer modelling tools that incorporate the complexity of the subsurface. We will develop a new computer algorithm that uses an innovative approach to model the Earth in three dimensions. Computer codes will be available through the national AuScope infrastructure facilities, so that researchers will have free access to algorithms, largely for the first time, to better interpret their data.

DP1096662 Prof GJ Hugo

Approved Project Title **Circular Migration in Asia, the Pacific and Australia: Empirical, Theoretical and Policy Dimensions**

2010 : \$ 186,000
2011 : \$ 126,114
2012 : \$ 206,000
2013 : \$ 149,886
2014 : \$ 176,000

Primary RFCD 3705 DEMOGRAPHY
APF Prof GJ Hugo

Administering Organisation The University of Adelaide

Project Summary

Few issues have been more significant in contemporary Australia than international migration. It is of fundamental importance to Australia's future as it faces the global economic downturn, ageing, climate change and an ever-changing relationship with its Asia-Pacific neighbours. In the past Australia's migration relationship with its region has been almost totally seen as a source of skilled settlers. However this relationship is increasingly a more complex one. Migration will continue to be fundamental to the nation's economy, society and security and this study seeks to provide an evidence base for better policy and practice in immigration and development.

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DP1096083 Dr N Iannella
Approved Project Title **A modelling challenge: bridging the gap between molecular and neuronal networks**
2010 : \$ 105,000
2011 : \$ 83,000
2012 : \$ 83,000
Primary RFCD 2899 OTHER INFORMATION, COMPUTING AND COMMUNICATION SCIENCES
APD Dr N Iannella
Administering Organisation The University of Adelaide

Project Summary

We will develop innovative frameworks, which unify small-scale molecular activity with electrical signals in branches of brain cells. This research aims to enhance our understanding how molecular scale phenomena influence brain disease, via studying the model dynamics using cutting-edge techniques on a supercomputer. The socio-economic benefits to Australia include: (i) Enhancing Australia's international reputation for cutting-edge multidisciplinary research; (ii) international collaborations will be strengthened; (iii) outcomes will potentially lead to commercialisation opportunities; (iv) results will ultimately lay the foundations to explore the cellular and molecular origin of brain disorders.

DP1096126 Prof R Ivell
Approved Project Title **Non-classical steroid signalling through SF-1 responsive genes: a key mechanism in environmental endocrine disruption, cancer, and aging**
2010 : \$ 120,000
2011 : \$ 110,000
2012 : \$ 110,000
Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY
Administering Organisation The University of Adelaide

Project Summary

Endocrine disruption by pervasive manmade chemicals, which mimic natural hormones, and are found in plastics, cosmetics, and fire retardants, is known to cause developmental defects in model organisms and wildlife, with substantial risk also to human health. This risk increases with increasing population density and dependence on water recycling. Current tests to assess such substances use oversimplified modes of hormone action and grossly underestimate the risk of endocrine disruption. This proposal will yield new knowledge about how such substances act in the body, or on wildlife, and form the basis for new more sensitive methods of environmental monitoring.

DP1094796 Prof MF Lambert; Prof GA Kuczera; Dr MA Thyer; Dr AV Metcalfe
Approved Project Title **A new flood design methodology for a variable and changing climate**
2010 : \$ 110,000
2011 : \$ 110,000
2012 : \$ 120,000
Primary RFCD 2605 HYDROLOGY
Administering Organisation The University of Adelaide

Project Summary

The extreme temporal and spatial variability of Australia's rainfall affects the quantity and quality of water resources, the productivity of agricultural systems, and aquatic and terrestrial ecosystems. Given the impact of extreme events such as floods and the massive investment in water-related infrastructure, evaluation of these risks is an issue of national economic and environmental significance. Monte Carlo simulation techniques will quantify the risks associated with current and future climate change, and the combined risks that come from multiple sources, such as from coastal tides and storm runoff. This research will provide a new spatial framework for calculating risk as well as tools to evaluate flood risk.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093605 Dr P Marschner; Prof C Tang; Prof F Zhang

Approved Project Title **How do legumes improve phosphorus uptake of the following wheat?**

2010 : \$ 75,000

2011 : \$ 75,000

2012 : \$ 75,000

Primary RFCD 3002 CROP AND PASTURE PRODUCTION

Administering Organisation The University of Adelaide

Project Summary

World rock phosphate reserves for manufacturing phosphorus (P) fertilisers will be depleted in 50-100 years. Thus it is critical to reduce the reliance of the Australian agriculture on P fertilisers. The long-term application of P fertilisers has resulted in accumulation of P in a soil P bank which is unavailable to crops such as wheat. Legumes may have access to the soil P bank and increase growth and P uptake by the following wheat, but the mechanisms behind this effect are unclear. In this multidisciplinary international collaboration, we will characterise the changes in soil chemistry and microbiology in the legume-wheat rotation. The knowledge generated could result in greater utilisation of the soil P bank and decreased P fertiliser use.

DP1095263 Prof SR McColl; Prof AF Lopez

Approved Project Title **Structural and functional characterisation of PI3Kgamma, uniquely activated by p101.**

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 110,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Adelaide

Project Summary

The movement of cells is involved in all aspects of life including development, growth and maintenance of organisms. In spite of this, our understanding of the mechanism involved in cell migration is limited. There are a number of conditions in which the ability to control cell movement would be of significant benefit. Examples include autoimmune conditions, asthma and cancer, the social and economic burdens of which account for billions of dollars and millions of Australians. This project aims to understand one of the major mechanisms that controls cell migration, which is expected to produce significant economic and social outcomes in the areas of basic science knowledge, human health, and biotechnology.

DP1096053 Prof Z Michalewicz; Prof R Zurbruegg; Mr A Ghandar

Approved Project Title **Computational Intelligence Methods for Financial Applications**

2010 : \$ 55,000

2011 : \$ 55,000

2012 : \$ 55,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The University of Adelaide

Project Summary

Complex financial problems can be better addressed with software that can learn from available data and adapt to environmental changes. It is therefore essential to develop technologies that enable prediction and optimisation in constrained and dynamic environments. There are currently some limitations in existing business decision support systems despite their ubiquity providing an opportunity for Australia to be at the forefront as new standards in the field are developed. Furthermore, the fund management industry (particularly superannuation) is significant to the Australian economy and development of this technology has the potential to enhance its performance and reputation.

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DP1093059 Prof P Mühlhäusler

Approved Project Title **New words for new things: Formal and substantive aspects in the development of the Pitkern-Norf'k language**

2010 : \$ 118,514
2011 : \$ 123,514
2012 : \$ 156,919

Primary RFCD 3802 LINGUISTICS

Administering Organisation The University of Adelaide

Project Summary

This project will help consolidate Australia's reputation as a leader in contact language research. It will strengthen Australia's social and economic fabric by involving a small remote community in research on their endangered language, thereby sustaining community cohesion and a sense of identity. The publications arising from the research will have direct applications to language revival, teaching, and cultural tourism as currently promoted by the Norfolk Island Assembly.

DP1092488 Prof GJ Nathan; A/Prof BB Dally; Prof H Pitsch

Approved Project Title **Detailed understanding of the behaviour of soot in, and emission from, turbulent flames and fires**

2010 : \$ 190,000
2011 : \$ 150,000
2012 : \$ 160,000

Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY

Administering Organisation The University of Adelaide

Project Summary

While combustion processes involving soot have been widely employed for many years, their great complexity puts them beyond present capacity to understand or model reliably. Within a flame, soot plays an important role in radiant heat transfer, and hence in energy efficiency. Beyond a flame, soot can either be emitted as an unwanted air pollutant or as a desirable source of nano-particles, depending on the application. The benefits to society from improved understanding and predictive capability include reduced air pollution, improved health and safety, increased efficiency in the utilisation of both fossil and alternative fuels, the support of the rapidly growing sector employing carbon nano-particles and increased fire safety.

DP1095363 A/Prof AE Nettelbeck; A/Prof RK Foster; Dr RC Smandych; Em/Prof L Knafila

Approved Project Title **The rule of law in history and memory: Australian and Canadian settler frontiers**

2010 : \$ 35,000
2011 : \$ 80,000
2012 : \$ 80,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The University of Adelaide

Project Summary

This study is inspired by current 'History Wars' debates in Australia and Canada, which in raising questions about 'what happened' in the colonial past have demonstrated that the shape of the nation's historical memory is of vital present day importance. These debates have shown that more detailed historical research is required into how the frontiers of European settlement evolved in practice, and how Indigenous populations were made subject to colonial legal authority. As a project of comparative history, the study is of international as well as national significance. It has the potential to generate improved understanding of current conditions by highlighting differences and similarities between Australian and Canadian experiences.

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DP1095069 Prof A Pring; Dr J Brugger

Approved Project Title **Experimental studies on hydrothermal reaction processes at the molecular level: the role of mineral replacement reactions in ore formation**

2010 : \$ 160,000

2011 : \$ 160,000

2012 : \$ 140,000

2013 : \$ 130,000

Primary RFCD 2601 GEOLOGY

Administering Organisation The University of Adelaide

Project Summary

Most of the World's supply of metals such as copper (Cu), gold (Au), molybdenum (Mo), lead (Pb), zinc (Zn) or uranium (U) comes from hydrothermal ore deposits. The metals were deposited deep below the Earth's surface when hot fluids, carrying minute quantities of the metals, reacted with suitable rocks to form ore minerals. By understanding molecular-level reaction mechanisms at high pressure and temperature, we can predict the nature of the ore minerals formed for a given set of physical and chemical conditions. This multidisciplinary research project is devoted to understanding these chemical and physical processes and how this knowledge can be applied to improve mineral exploration, mining, and ore processing.

DP1093143 Dr TL Pukala; Prof JH Bowie

Approved Project Title **Novel Mass Spectrometric Approaches to the Study of Protein-Protein Interactions**

2010 : \$ 120,000

2011 : \$ 120,000

2012 : \$ 120,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Administering Organisation The University of Adelaide

Project Summary

Protein-protein interactions mediate all fundamental cellular processes, yet the structural complexity of protein assemblies mean they are often difficult to characterise using traditional analytical methods. This project will develop and demonstrate novel mass spectrometric approaches towards a molecular level description of the structure and interactions of biological protein complexes, which in turn may underpin the rational design of drugs for the treatment of a range of human health conditions. This project will also provide training of young researchers to the highest international standards in mass spectrometry and protein science, for benefit to Australian industry and research.

DP1096901 Prof IM Reid; Prof RA Vincent; Prof U Inan

Approved Project Title **The Response of the Middle Atmosphere to Solar and Dynamical Forcing**

2010 : \$ 180,000

2011 : \$ 130,000

2012 : \$ 130,000

Primary RFCD 2499 OTHER PHYSICAL SCIENCES

Administering Organisation The University of Adelaide

Project Summary

The region of the atmosphere and ionosphere between 50 and 100 km is difficult to measure directly. We will use a unique array of instruments deployed across Australia to study how this region responds to waves generated in the lower atmosphere and to changes in electromagnetic energy from the sun and particle precipitation from the magnetosphere. Outcomes will help our understanding of how the region is responding to rising levels of greenhouse gas concentrations. Cooling effects are already apparent and our research will look for additional evidence of change.

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DP1096533 Dr GP Rowell; A/Prof BR Dawson; Dr F Aharonian
Approved Project Title **Revealing Cosmic-Ray Accelerators with Gamma-Ray and Millimetre Radio Observations**
2010 : \$ 40,000
2011 : \$ 40,000
2012 : \$ 50,000
Primary RFCD 2401 ASTRONOMICAL SCIENCES
Administering Organisation The University of Adelaide

Project Summary

Australia plays a pivotal role in studies of the Universe at extreme energies, via experiments studying the highest energy particles known as cosmic-rays. This project will combine the diverse fields of gamma-ray and radio astronomy to understand where these cosmic-rays in the Milky Way come from. Australian radio telescopes in tandem with an Australian supported high energy gamma-ray telescope offer the best chance to tackle this 100 year old problem. The project will generate a new look at our Milky Way disrupted by extreme objects such as exploding stars, and, provide a new science and high technical training opportunity for Australian researchers to tackle a fundamental problem in nature.

DP1094176 Prof O Schmidt; Dr S Asgari; Prof IB Faye
Approved Project Title **Cell-free immune reactions and suppression**
2010 : \$ 100,000
2011 : \$ 100,000
2012 : \$ 100,000
Primary RFCD 2705 ZOOLOGY
Administering Organisation The University of Adelaide

Project Summary

Insect pests and insect vectors of diseases are managed by toxic substances, but insects have a cunning ability to persist. How pesticide-tolerant insect pests recognise and inactivate chemical and biological toxins is poorly understood. While vertebrates with a closed circulatory system use coagulation reactions mainly for wound-healing, invertebrates employ cell-free aggregation reactions for the sequestration and inactivation of potentially damaging objects and substances. We use insect plasma to dissect recognition and inactivation of damaging objects and substances with the aim to understand tolerance and its inhibition to design novel strategies in delaying tolerance to pesticides in insect pests.

DP1092507 Dr C Semmler; Prof N Brewer; Dr AB Douglass
Approved Project Title **The distortion of eyewitness identification testimony**
2010 : \$ 78,000
2011 : \$ 70,000
2012 : \$ 82,000
Primary RFCD 3801 PSYCHOLOGY
Administering Organisation The University of Adelaide

Project Summary

A fair and efficient criminal justice system is important. This project will contribute to the continually expanding knowledge base required for improving the collection and use of eyewitness identification testimony. Ultimately, the adoption of principles suggested by this knowledge base will improve the validity and probative value of eyewitness evidence. This will advance the already significant contribution that Australian psychological science is providing for the administration of criminal justice.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1095270 Prof AR Simpson; Prof MF Lambert; Prof LB White

Approved Project Title **Frequency Domain Micro-Reflection Processing for Pipe Condition Assessment**

2010 : \$ 120,000

2011 : \$ 120,000

2012 : \$ 130,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation The University of Adelaide

Project Summary

Over the coming years many millions of dollars will be spent on upgrading deteriorated pipeline infrastructure that is part of water distribution systems all over Australia. Determining the condition of buried pipes is very difficult and expensive. This research will solve that problem. We will develop powerful numerical methods for non-invasive pipe condition assessment. Small controlled transients will be input by a specially designed signal generation device that can determine the condition of the inside of the pipe. These new techniques will be cost-effective, accurate and able to cover very long distances of pipe. Water authorities will then be able to quickly decide which sections of pipe require further investigation.

DP1095542 Prof MA Tester

Approved Project Title **Characterisation of PQ loop proteins in plants: are they voltage insensitive nonselective cation channels?**

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 110,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Administering Organisation The University of Adelaide

Project Summary

Millions of hectares of Australian agricultural land are affected by salinity. This results in the loss of hundreds of millions of dollars in revenue each year. The identification of the pathway for the initial influx of Na⁺ into plants from the soil will be important in helping to develop crop plants that are salt tolerant. This will increase our understanding of the mechanisms of salinity tolerance, an area of great importance to Australian agriculture and environmental sustainability. The future applications of this work will increase agricultural productivity and enhance the quality of life for both Australians and the international community.

DP1095603 Prof SD Tyerman

Approved Project Title **Aquaporins in roots: resolving observations linking them to diverse processes in water relations and plant productivity**

2010 : \$ 160,000

2011 : \$ 160,000

2012 : \$ 160,000

Primary RFCD 3002 CROP AND PASTURE PRODUCTION

Administering Organisation The University of Adelaide

Project Summary

The knowledge we gain will benefit Australia by allowing better management of plant water use and productivity. This is critical for adaptation to a drier climate where water is a critical resource. Large quantities of water move through aquaporin proteins in plants, therefore our understanding of these and the way they influence other processes in plant growth could enable us to manipulate plants to conserve water or to extract it more efficiently from the soil. Molecular aspects of the project could reveal new unexploited links between water and plant productivity. High calibre PhD and Honours students will also be educated to maintain the momentum of international excellence within Australia in the field of plant water relations.

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DP1096358 Prof M Weder; A/Prof F Collard; Dr J Wong
Approved Project Title **Understanding the Effects of News Shocks on Macroeconomic Fluctuations**
2010 : \$ 62,000
2011 : \$ 62,000
2012 : \$ 62,000
Primary RFCD 3402 APPLIED ECONOMICS
Administering Organisation The University of Adelaide

Project Summary

There are significant potential benefits for Australia. First, it could lead to more effective policymaking, with an understanding of how policy in one branch of the government can affect other sectors that have not been considered before. For example, changes in fiscal policy can affect not just growth, but also unemployment, inflation, and the income distribution. Second, this project will make a contribution to the research training of new macroeconomists in Australia: we will train three PhD students in the very latest methods. We also will organize a conference and bring the very top economists in the world to work with researchers here, and to consider issues surrounding the Australian economy.

DP1097033 A/Prof ML Whitelaw; Dr DJ Peet; Prof L Poellinger
Approved Project Title **Single minded 1 in neuron development and satiety signalling**
2010 : \$ 120,000
2011 : \$ 120,000
2012 : \$ 120,000
Primary RFCD 2702 GENETICS
Administering Organisation The University of Adelaide

Project Summary

An understanding of how Single minded 1 (SIM1) regulates target genes may allow new pharmaceutical approaches to be designed to combat obesity. As Sim1 belongs to a family of closely related gene regulatory proteins which function in early development and homeostasis, deciphering the molecular control mechanisms of Sim1 may help understand how the related factors function in processes such as angiogenesis, response to low oxygen stress, invasion of environmental pollutants and autism spectrum diseases. The ability to manipulate these factors would be of great benefit in treating a range of disorders, but a thorough molecular understanding of these factors needs to be obtained prior to attempting design of pharmaceuticals.

DP1095151 Mr W Withayachumnankul
Approved Project Title **Terahertz Metamaterials for Molecular Sensing**
2010 : \$ 80,182
2011 : \$ 80,182
2012 : \$ 80,182
Primary RFCD 2999 OTHER ENGINEERING AND TECHNOLOGY
APD Mr W Withayachumnankul
Administering Organisation The University of Adelaide

Project Summary

Metamaterials are fascinating new man-made structures that can manipulate beams of light in surprising ways; eg. metamaterials are being studied as 'cloaking devices' to render objects invisible. Our proposal aims for fundamental studies and improvement of metamaterials operating in the terahertz (T-ray) frequency regime. The outcome will be the exploitation of new metamaterial devices for high performance molecular sensors and electromagnetic filters operating at terahertz frequencies. Socioeconomic benefits to Australia include: (i) increased knowledge-base in metamaterials operating in the terahertz range; (ii) the underpinning of applications in biophotonics and communications; and (iii) commercialisation of novel terahertz devices.