

Australian Capital Territory

The Australian National University

DP1092571 Prof BD Anderson; Prof Dr M Deistler

Approved Project Title **Modelling, forecasting, and control for econometrics based on generalized dynamic factor models: a system theoretic approach**

2010 : \$ 100,000

2011 : \$ 100,000

2012 : \$ 118,000

Primary RFCD 2302 STATISTICS

Administering Organisation The Australian National University

Project Summary

The project will provide a tool that will assist organizations wishing to understand the dynamics of a national economy to model it, and to forecast future econometric time series values. Such ability will provide another tool to econometric managers, including the Reserve Bank , Treasury and fund managers, that should benefit the Australian nation.

DP1093759 Dr OK Atkin; Dr JR Evans; Dr MG Tjoelker; Dr SA Sitch; Prof JJ Lloyd

Approved Project Title **Leaf respiration under drought: a global perspective**

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 110,000

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

Predicting future net carbon exchange is necessary for better management of vegetation resources by Australia. Incorporating the responses of plant respiration to drought and temperature is crucial for predicting future rates of net carbon exchange. Using laboratory and field studies, this research will develop an understanding of how water availability and temperature impact on plant respiration of a broad range of economically important and ecologically relevant plant species. Equations will be formulated that will improve how modellers calculate drought-dependent variations in plant respiration (and thus plant productivity), thereby improving predictions for a future, warmer world.

DP1096749 Prof MC Ball; Dr CE Lovelock; Dr B Choat; Dr L Sack

Approved Project Title **Salinity tolerance along an aridity gradient: linking physiological processes with morphological constraints on leaf function in mangroves**

2010 : \$ 115,000

2011 : \$ 107,000

2012 : \$ 104,000

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

The proposed research will provide insight into the physiological and morphological features that control the productivity of mangrove forests across broad gradients in salinity and aridity. Central to this is this identification of plant traits that increase salt and drought tolerance, which will assist in the development of plant varieties suited to Australian conditions. The results will also contribute to development of process-based models to better predict the response of mangrove vegetation to changing climate. A deep understanding of the processes that influence the growth and survival of mangroves is of fundamental importance to sustainable fisheries and protection of wildlife reliant on coastal ecosystems.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1095053 Dr TT Barrows; Prof BJ Pillans

Approved Project Title **Understanding global warming using long-term glacier retreat records**

2010 : \$ 80,000

2011 : \$ 80,000

Primary RFCD 2601 GEOLOGY

Administering Organisation The Australian National University

Project Summary

This project will determine the sensitivity of climate to future global warming, contributing to understanding one of the greatest problems facing humanity today. We will take an historic approach, determining the effects of the greatest global warming in Earth's recent history after the last ice age 20,000 years ago. By constructing well-dated, accurate records of glacier retreat at key locations, we will quantitatively estimate temperature change as the planet warmed. These findings will help us understand the future effects of global warming so that we are better prepared for the environmental and economic costs.

DP1093353 Prof MT Batchelor; Dr X Guan; Prof WV Liu

Approved Project Title **Quantum many-body systems with higher mathematical symmetries**

2010 : \$ 80,000

2011 : \$ 80,000

2012 : \$ 80,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

Ongoing developments in the experimental realisation of ultracold quantum systems play a leading role in the international effort towards the eventual realisation of quantum technology. This project brings together Australian and US researchers with complementary strengths to develop the mathematical study of fundamental systems of interacting quantum particles of relevance to experiments. The project will ensure that Australian researchers participate in and benefit from international developments in a leading edge area of fundamental research. It will also contribute to training students in rapidly advancing areas with the capacity to contribute to a wide range of problems, including the emerging technology of quantum devices.

DP1096711 Prof VV Bazhanov; Prof A Bobenko

Approved Project Title **Quantization of polyhedral surfaces**

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 100,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

Recent developments in the theory of discrete surfaces have revealed their fascinating links to many other areas of mathematics including integrable systems and quantum geometry. Rapid progress in this field is motivated by applications in pure mathematics, mathematical physics, computer graphics and engineering. Australian researchers are world recognized experts in integrable systems and this project will link them together with German experts in discrete differential geometry. The project will advance our knowledge base in fundamental and applied sciences and offer a unique research training opportunity for students in contemporary areas of pure and applied mathematics.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096713 Prof VV Bazhanov; Em/Prof RJ Baxter; Prof JH Perk

Approved Project Title **Fundamental mathematical structures in statistical and quantum systems**

2010 : \$ 110,000

2011 : \$ 105,000

2012 : \$ 90,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

Mathematics is playing a key role in modern science and technology. This project will bring together world leading experts from Australia and the USA to unravel the most fundamental mathematical structures in of statistical and quantum systems arising in settings ranging from physics of tiny quantum dots to string theory in high energy physics. This research will ensure Australia's involvement in cutting-edge international developments in mathematical sciences poised to deliver new significant results in the fundamental quantum theory of matter. The project will also contribute to training young researchers to maintain Australia's international standing in fundamental science.

DP1093569 Dr J Bernu; Prof P Grangier; Dr N Treps

Approved Project Title **Non-Gaussian states and entanglement distillation for Continuous Variable quantum information protocols**

2010 : \$ 125,000

2011 : \$ 110,000

2012 : \$ 105,000

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr J Bernu

Administering Organisation The Australian National University

Project Summary

Amplifiers are important devices for electronic, computer as well as telecommunication industries. In the quantum world where light's corpuscular nature is prominent, amplification of a beam of light will have its associated noise penalty. This noise penalty sets limit to many quantum optical applications. This proposal aims to use a method based on conditional detection to realize a 'noiseless linear amplifier' that has no noise penalty probabilistically. Realization of this key device is central to extending the range of quantum communication, such as quantum cryptography. It also has applications in quantum computing and the potential to enhance sensitive measurements.

DP1096417 Prof GV Bicknell; Dr Z Kuncic

Approved Project Title **Black Hole Accretion: The Effects of Magnetic Fields and Radiation**

2010 : \$ 130,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2804 COMPUTATION THEORY AND MATHEMATICS

Administering Organisation The Australian National University

Project Summary

This project represents a significant contribution by Australian researchers to one of Science's Big Questions: How do Black Holes channel gravitational energy into radiation at many different energies and into high speed outflows. It offers Australian Astronomy an opportunity to expand its endeavours into the rapidly growing and high profile areas of high-energy and computational astrophysics, injecting new expertise into the interpretation of multi-wavelength data on accreting black holes. We will train a new cohort of internationally competitive students and early career researchers, equipping them with the advanced computational and modelling skills that are in increasingly higher demand in many technology-based industries.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096759 Dr LE Botterill; Dr DA Wilhite; Dr MJ Hayes

Approved Project Title **The role of science in the policy process: responding to drought in Australia and the USA**

2010 : \$ 20,000
2011 : \$ 42,000

Primary RFCD 3602 POLICY AND ADMINISTRATION

Administering Organisation The Australian National University

Project Summary

Recent research has predicted more frequent and increasingly severe drought events for Australia in the future. Effective management of drought risk requires timely and relevant scientific information, placing scientific advice at the heart of a successful national drought management strategy. There is considerable potential for mutual policy learning as a result of a comparison of the role of scientists in drought policy in the US and Australia. This research project will also strengthen existing ties with top international drought researchers and promote opportunities for further international collaboration in the field of drought research and also in the consideration of the role of scientific advice in the policy process.

DP1096833 Prof RG Broadhurst; Dr K Choo

Approved Project Title **The evolution of cybercrime: the monitoring of serious crime in cyberspace**

2010 : \$ 114,000
2011 : \$ 93,000
2012 : \$ 143,000

Primary RFCD 3904 LAW ENFORCEMENT

Administering Organisation The Australian National University

Project Summary

The research ascertains future threats in cyberspace, in particular, the role of serious criminal networks. The evidence generated will benefit law enforcement, information security industries and policy makers in terms of resource assessment, law reform, and the development of effective mutual legal assistance regimes. The data enable the monitoring of cybercrime, and generate relevant metrics that inform public education aimed to reduce risks to individuals and organizations targeted by cybercrime. The research enables law enforcement, lawmakers and other key stakeholders to better understand and manage new cybercrime threats and to develop rapid and innovative solutions to serious forms of cybercrime.

DP1095247 Dr JJ Brocks; Dr NJ Butterfield

Approved Project Title **Molecular fossils, the evolution of Earth's early oceans and the origin of the oldest oil**

2010 : \$ 165,000
2011 : \$ 150,000
2012 : \$ 155,000
2013 : \$ 110,000
2014 : \$ 75,000

Primary RFCD 2603 GEOCHEMISTRY

QEII Dr JJ Brocks

Administering Organisation The Australian National University

Project Summary

Australia retains undiscovered oil reserves. We believe that a change in primitive marine life forms may have fundamentally changed the chemistry of the Earth's oceans and is responsible for the world's oldest oil reserves. While these reserves have been found, and successfully commercialised, overseas, similar reservoirs in Australia remain elusive. The project will develop and apply technologies based on hydrocarbon biomarkers to help determine the oil-producing rock types of Precambrian sedimentary rocks. This allows us to estimate the oil's age and predict where petroleum reservoirs may be hidden. PhD students involved in the project will gain valuable knowledge about the link between changes in ecology and the carbon cycle.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094699 Dr CJ Burden; Dr S Foret; Prof SR Wilson; Dr J Taylor

Approved Project Title **Mathematical Methods for Next Generation Sequencing**

2010 : \$ 100,000

2011 : \$ 85,000

2012 : \$ 90,000

Primary RFCD 2399 OTHER MATHEMATICAL SCIENCES

Administering Organisation The Australian National University

Project Summary

The emergence of a new generation of high throughput genomic sequencing technologies is providing unprecedented opportunities for biological research. Hidden within the huge amounts of data generated by this technology is information about the expression and regulation of genes, and the complex functional purpose of non-coding, so called 'junk', DNA. Development of mathematical and statistical tools is essential to interpreting these data. The proposed research will enhance Australia's reputation for developing novel quantitative techniques at the cutting edge of modern biology. The proposed project has a broad range of potential applications in biotechnology, particularly in the medical and agricultural industries.

DP1092682 Prof AL Carey; Prof M Marcolli; Dr B Wang

Approved Project Title **Invariants of singular spaces from noncommutative geometry**

2010 : \$ 115,000

2011 : \$ 110,000

2012 : \$ 110,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

The project addresses questions of significance at the international forefront in the mathematical sciences and the ARC funds will enable research training of students and postdoctoral fellows at this very high level. International collaboration and networking is a key feature that will enhance Australia's scientific standing and provide opportunities for early career researchers to engage internationally with world leaders. The maintenance of a high quality research program at ANU enhances Australia's ability to attract international students and places the ANU in the top league of world universities. It brings with it recognition of Australia as a culturally advanced nation.

DP1095157 Dr A Catanzariti; Dr M Rep

Approved Project Title **Pathogen recognition and plant-defence activation by a novel Fusarium wilt-resistance protein from tomato**

2010 : \$ 110,000

2011 : \$ 110,000

2012 : \$ 110,000

Primary RFCD 2704 BOTANY

APD Dr A Catanzariti

Administering Organisation The Australian National University

Project Summary

The devastating effects of Fusarium wilt disease of tomato is a threat to one of Australia's most economically important horticultural crops. Resistant tomato varieties offer the most effective means of control but the fundamental mechanisms underlying this resistance are yet to be understood. This research will increase our understanding of resistance to Fusarium wilt disease. The knowledge gained will assist in the development of new robust, sustainable approaches to disease control, as well as the development of pre-emptive strategies to avert major outbreaks, which will ensure reliable productivity and minimal economic losses into the future.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1097264 Prof DJ Chalmers; Dr U Kriegel

Approved Project Title **The basis of conscious thought**

2010 : \$ 121,000
2011 : \$ 40,000
2012 : \$ 97,000
2013 : \$ 90,000
2014 : \$ 98,000

Primary RFCD 4401 PHILOSOPHY

Administering Organisation The Australian National University

Project Summary

The science and philosophy of consciousness has made much progress in recent years, and the study of conscious thought is the next frontier. The project will place Australian research on the leading edge of this area. An international network of researchers will analyse both the neurobiological basis and the subjective experience of conscious thought, yielding a unified account of conscious thinking from the first-person and third-person perspectives. The resulting account will illuminate the nature of human thinking and reasoning, and will be applied to the detection of consciousness in post-coma patients.

DP1096653 A/Prof C Charles

Approved Project Title **Current-free double layers applied to astrophysical objects and space propulsion**

2010 : \$ 60,000
2011 : \$ 60,000
2012 : \$ 65,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Organisation The Australian National University

Project Summary

The collaboration between the ANU research group and European Aeronautic Defence and Space Company (EADS) ASTRIUM, the largest European aerospace company, is a unique opportunity for Australia to capitalize on the new discovery of the Helicon Double Layer Thruster made at the ANU. This will allow the Australian space community to stay abreast of international developments in space propulsion and to be with the forerunners of this new technology. ANU will have direct access to EADS-ASTRIUM via the relationships developed in this project putting Australia in the enviable position of being an insider in future space developments concerning plasma thrusters and space technology in general.

DP1093827 Prof WS Chow

Approved Project Title **Probing the four photosynthetic membrane protein complexes at work in situ in leaves**

2010 : \$ 90,000
2011 : \$ 89,000
2012 : \$ 89,000

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

This proposal aims at sustainable improvements in plant productivity and photosynthetic adaptation in drastic Australian climates. In photosynthesis, membranes with the four multiprotein complexes use sunlight to make compounds that drive carbon assimilation. Instead of the usual dissection of photosynthetic membranes, this project will develop and refine the applicant's rapid, reliable, non-intrusive techniques to probe the four membrane complexes at work in their native state in leaves. Two portable commercial instruments will potentially emerge from the techniques. This novel non-reductionist approach will identify key limitations to photosynthetic performance under stress, and insights into improvements for primary plant productivity.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1092537 Em/Prof GW Clarke; Dr HM Jackson

Approved Project Title **The archaeology of cultural interaction: The working lives of Greek colonists and indigenous Syrians in Seleucid Syria**

2010 : \$ 119,000

2011 : \$ 102,000

2012 : \$ 121,000

2013 : \$ 78,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

Administering Organisation The Australian National University

Project Summary

The discovery of the unique importance of Jebel Khalid is well known internationally and the project has brought considerable overseas recognition of the contribution of Australian archaeology to Levantine studies. The project fosters research collaboration between Australian and Syrian researchers and institutions and establishes Australia as a major centre for the study of the archaeology of Syria. It also fosters goodwill between Australia and an important member of the Arab world and contributes to improving local perceptions of that region.

DP1096349 Prof JD Close; Dr NP Robins; Prof A Aspect; Prof MA Kasevich; Prof Dr MK Oberthaler

Approved Project Title **Advanced Atomic Sources for Precision Measurement**

2010 : \$ 59,797

2011 : \$ 150,000

2012 : \$ 150,000

2013 : \$ 100,000

2014 : \$ 70,000

Primary RFCD 2403 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PHYSICS

QEII Dr NP Robins

Administering Organisation The Australian National University

Project Summary

Many advances in our technology-driven society rely on the precision measurement of quantities such as accelerations, magnetic and electric fields. A higher level of measurement precision leads to a clear economic or strategic advantage. We expect to provide the Australian industrial and government sectors with new and better methods for making precise measurements with accelerometers, gyroscopes and gravity gradiometers. This proposal will place Australia with only a handful of other countries as an international leader in the new technology of coherent atom interferometry. It is expected that this proposal will lead to innovative prototype devices as well as significant patentable technology.

DP1092565 Prof A Cockburn; Dr M van de Pol; Dr LE Kruuk

Approved Project Title **Fitness in free-living populations in a changing world**

2010 : \$ 152,000

2011 : \$ 160,000

2012 : \$ 165,000

2013 : \$ 87,000

2014 : \$ 62,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

APD Dr M van de Pol

Administering Organisation The Australian National University

Project Summary

We understand very little about the evolutionary and ecological response of populations to periods of rapid environmental change or volatility. New methods raise the possibility dissecting the various causes of change, and their demographic consequences. However, these methods depend on long-term studies of the genealogy, survival and reproductive success of individuals. Data on the iconic superb fairy-wren will be used to establish this species as a model for the study of climate change, and the extent to which living in social groups helps or hinders evolutionary response to such change.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094170 A/Prof ML Coote; Prof PM Gill

Approved Project Title **Supramolecular Rip-n-Sew - New Computational Tools for Modelling Supermolecules**

2010 : \$ 160,000

2011 : \$ 140,000

2012 : \$ 140,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

Administering Organisation The Australian National University

Project Summary

This project will develop new computational tools for predicting the chemical behaviour of large molecular and supramolecular systems with an accuracy and efficiency that has not previously been possible. It will also increase our mechanistic understanding of the principles governing supramolecular assembly in chemical and biological systems. This will enable cost and time savings in the design of advanced materials in the medical and agricultural contexts.

DP1093774 Prof SF Cox; Prof Dr JL Urai; Prof GM Dipple

Approved Project Title **Dynamic permeability and the evolution of fluid pathways in fracture-controlled hydrothermal systems**

2010 : \$ 95,000

2011 : \$ 110,000

2012 : \$ 95,000

Primary RFCD 2601 GEOLOGY

Administering Organisation The Australian National University

Project Summary

This project will advance knowledge of how fracture-controlled fluid flow at depth in the Earth influences the strength and mechanical behaviour of the crust, earthquake processes, and the formation of hydrothermal ore systems. Fundamental new knowledge of the dynamic variations in fluid transport properties and flow distribution in deep fracture networks also will have application for understanding hydrocarbon migration in fractured reservoirs, controls on seal integrity in geosequestration projects, and for geothermal energy production from hot, fractured rock. The project will develop international collaboration and train young scientists in applying multidisciplinary approaches to exploring fluid systems in the Earth's crust.

DP1095290 Dr A Dehghani

Approved Project Title **Development of Control Methodologies for Drug Dosing in Biomedical Engineering**

2010 : \$ 90,000

2011 : \$ 85,000

2012 : \$ 85,000

Primary RFCD 2301 MATHEMATICS

APD Dr A Dehghani

Administering Organisation The Australian National University

Project Summary

This research proposal is very relevant to the National Research Priorities in the areas of Frontier Technologies and Breakthrough science. At a broader level, we aim to assist in the development of a national competence in what has been an emerging and promising discipline. The research will develop fundamental and enabling laws and techniques for drug administration to regulate physiological variables such as blood pressure and degree of consciousness in critical care patients.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096130 Dr AS Desyatnikov; Prof YS Kivshar; Prof G Assanto

Approved Project Title **Photonic routing with liquid crystals**

2010 : \$ 145,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Organisation The Australian National University

Project Summary

Liquid crystals became a household item but their unequaled nonlocal optical properties are much less known and studied, although the breathtaking prospects of their future applications in photonics inspire many experts around the world. We will bring to Australia the state of the art research approach, theoretical and experimental, aiming to uncover and realize the potential of long range interaction between laser light and nonlocal liquid crystals for futuristic all-optical devices. This project will promote and enhance the rapid development of photonics in Australia, as well as deliver foremost practical expertise and outstanding training of young researchers.

DP1094221 Dr RD Dewhurst

Approved Project Title **Utilising nature's complexity - understanding fundamental organometallic binding modes of furans and coordination of bioderived furans**

2010 : \$ 140,000

2011 : \$ 140,000

2012 : \$ 140,000

2013 : \$ 130,000

2014 : \$ 130,000

Primary RFCD 2599 OTHER CHEMICAL SCIENCES

QEII Dr RD Dewhurst

Administering Organisation The Australian National University

Project Summary

The earth's decreasing reserves of fossil fuels has prompted an intense push to utilise the renewable bioresources to replace the many products and fuels derived from petroleum. One of the promising developments is the production of so-called Furanics, useful molecules produced easily from carbohydrates found in waste materials from the sugar, corn and forestry industries. Given Australia's wealth of agricultural resources, discovering the full power of these potentially useful furanic compounds should be a major priority. This research aims to link Australia's biomass potential with the plastics, pharmaceutical, fine and agricultural industries.

DP1096299 Dr MA Djordjevic; Prof LN Mander; Prof CR Parish

Approved Project Title **New functions for bioactive flavonoids in plants and mammals**

2010 : \$ 140,000

2011 : \$ 120,000

2012 : \$ 130,000

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

We have discovered natural products with biological activity in plants and mammals. These molecules affect plant shape and development and the process of mammalian blood vessel formation. We seek to understand how these molecules work. More understanding is required before one can begin to utilise these molecules for possible beneficial agriculture or human health outcomes. Plant shape influences such things as yield or more drought-resilient root systems. Importantly, we have discovered specific molecules that either promote or inhibit blood vessel formation. A better understanding of how these molecules work could lead to novel treatments for cancer or cardiovascular disease.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093191 Dr MH Donohue; Dr TP Denham; Prof J Nichols; Prof MB Richards; Dr S Wichmann

Approved Project Title **New Guinea's place in Southeast Asia: a study integrating archaeology, linguistics and genetics**

2010 : \$ 137,000
2011 : \$ 106,000
2012 : \$ 116,000
2013 : \$ 43,000

Primary RFCD 3802 LINGUISTICS

Administering Organisation The Australian National University

Project Summary

The multi-disciplinary research will develop an historical context for understanding present-day processes of cultural interaction in eastern Indonesia. Understanding Australia's past, and that of its neighbours, is a clear need for our country. The Onin Peninsula of western New Guinea (within Indonesia's Papua Barat Province) is the focus of multi-disciplinary research, involving archaeology and linguistics, and incorporating human genetics to better understand the historical construction of identity within this region westward to Island Southeast Asia over the last 10,000 years and to develop closer ties with researchers in our neighbouring country.

DP1094562 Dr B Douglas; Dr C Blanckaert

Approved Project Title **Naming Oceania: geography, raciology and local knowledge in the 'fifth part of the world', 1511-1920**

2010 : \$ 90,000
2011 : \$ 60,000
2012 : \$ 25,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The Australian National University

Project Summary

A history of the marriage of space and race in our region restores Australia to regional histories and wider Oceania to global histories. It offers a grounded basis to grasp how regional, national and local nomenclatures and identities mutated over 400 years, in contexts of European exploration, imperialism, colonisation, emergence of the science of race and intensifying face-to-face encounters. By uncovering traces of past naming systems, Indigenous and foreign, the research will show how present names and boundaries of states, places and people are constructs rather than eternal truths. It will cast light on the antecedents to modern Australian regional interventions, neighbourly relations and conceptions of racial or ethnic differences.

DP1094219 Prof AF Dulhunty; Dr NA Beard; Dr R Dirksen

Approved Project Title **How triadin and junctin communicate with ryanodine receptors deep within a calcium store to determine skeletal muscle contraction**

2010 : \$ 110,000
2011 : \$ 100,000
2012 : \$ 100,000

Primary RFCD 2706 PHYSIOLOGY

Administering Organisation The Australian National University

Project Summary

The project results will provide a platform for muscle relaxants and other drugs that will specifically target either the heart or skeletal muscle and will have applications in the livestock, veterinary and pharmaceutical Industries. The project falls within the National Research Priorities of Promoting and Maintaining Good Health and Frontier Technologies for Building and Transforming Australian Industries, as well as the national priority goal of Ageing well, Ageing Productively. The project will be of national benefit in training undergraduate students, PhD students and a postdoctoral fellow in state-of-the-art techniques in an internationally competitive research field.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1095451 Prof S Easteal; Dr RB Williams; A/Prof LS Jermiin; Dr DG MacArthur

Approved Project Title **The role of short tandem repeat DNA variation in the evolution of human psychological diversity**

2010 : \$ 94,000

2011 : \$ 88,000

2012 : \$ 82,000

Primary RFCD 2702 GENETICS

Administering Organisation The Australian National University

Project Summary

The proposed work addresses fundamental questions about human nature. It ties together the evolutionary processes that have shaped us as a species with the way our genes influence: our personalities, the way we think and how we behave. It introduces a novel approach to addressing questions about the role of genetics in human variation that will contribute substantially to the way we understand, perceive and manage important aspects of human diversity.

DP1094329 Prof DJ Evans

Approved Project Title **Statistical Mechanics of Classical Glasses**

2010 : \$ 100,000

2011 : \$ 80,000

2012 : \$ 80,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

Glasses and ceramics can possess a combination of properties not available in other materials and thus they are of technological importance with rapidly developing applications. However a fundamental theoretical basis for describing these systems has been missing. The reason for this is that glasses are not in thermodynamic equilibrium, so the standard tools of equilibrium statistical mechanics cannot be rigorously applied. This project will make an important contribution towards building a strong local knowledge base by addressing the problem of understanding the glassy state. The knowledge base can then serve as a springboard for possible high tech applications in materials science and engineering.

DP1094740 Dr RM Eves

Approved Project Title **Masculinity, men and development: A critical analysis of violence, conflict and acquired immune deficiency syndrome (AIDS) prevention measures in Melanesia**

2010 : \$ 55,000

2011 : \$ 55,000

2012 : \$ 61,000

2013 : \$ 30,000

Primary RFCD 3799 OTHER STUDIES IN HUMAN SOCIETY

Administering Organisation The Australian National University

Project Summary

Australia is making great efforts to improve the situation in the Melanesian countries of our region through large amounts of development aid. Despite this, economic and social conditions continue to deteriorate. Widespread conflict, violence and the AIDS epidemic are significant factors in this decline. This project will critically examine the programs set up to encourage more constructive behaviour, particularly among men. It will contribute significantly to making Australia's efforts to address these profoundly destabilising problems more effective. The Australian Government recognises that it is strongly in our national interest to bring about an improvement in the wellbeing of our neighbours and friends in the region.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1097276 Prof GD Farquhar

Approved Project Title **Carbon uptake and water use by plants: is there pre-stomatal control?**

2010 : \$ 268,508

2011 : \$ 230,523

2012 : \$ 230,523

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

Society relies on mathematical descriptions of climate change, weather forecasting, crop performance, and other processes in which the control of carbon uptake and water loss by plants forms a basic element. Scientists also use the same element in ascribing sources and sinks of carbon dioxide (CO₂), describing vegetation, hydrological and ecological processes. A key physiological assumption in this element is now in doubt and we will test it rigorously and if necessary provide a robust alternative. We will do this by developing a novel 'window' on intact leaf functioning that will reveal the concentration of water vapour and other gases inside leaves.

DP1092584 A/Prof TA Faunce; Dr GF Urbas; Ms L Skillen

Approved Project Title **Detecting Fraud and Anti-Competitive Behaviour in the Australian Pharmaceutical and Medical Device Industries**

2010 : \$ 50,000

2011 : \$ 23,000

2012 : \$ 53,000

Primary RFCD 3901 LAW

Administering Organisation The Australian National University

Project Summary

This Project will deliver law reform proposals to ensure greater accountability and a reduction of fraud and anti-competitive behaviour associated with over 6 billion dollars of public money expended each year under the Pharmaceutical Benefits Scheme (PBS) as well as significant amounts paid by public hospitals on medical devices. It unites experts in Australian pharmaceutical regulation and high technology law enforcement with an eminent United States Partner Investigator in False Claims litigation. Reducing fraud and anti-competitive behaviour could be critical to survivability of the PBS and the benefits it brings particularly to an ageing population.

DP1096361 Dr L Fu; Dr SS Mokkalapati

Approved Project Title **High efficiency III-V solar cells based on low-dimensional quantum confined heterostructures**

2010 : \$ 130,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

APD Dr SS Mokkalapati

Administering Organisation The Australian National University

Project Summary

There is no doubt that clean and sustainable solar energy is one of the most viable energy sources to address the issues of climate change, global warming and depletion of conventional energy sources. With the great advantages offered by quantum confined nanostructures and nanotechnology, this project may lead to substantial efficiency improvement of current III-V solar cells (already higher efficiency than Si solar cells), making great contribution to the society and Nation in the areas of science, technology, environment, and economy.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1095673 Dr MK Gagan; Dr RN Drysdale; Dr JC Hellstrom; Dr IS Williams; Dr WS Hantoro; Prof L Edwards; Dr H Cheng; Dr GA Schmidt

Approved Project Title **Multi-proxy fingerprinting, absolute dating, and large-scale modelling of Quaternary climate-volcano-environment impacts in southern Australasia**

2010 : \$ 200,000

2011 : \$ 180,000

2012 : \$ 170,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Administering Organisation The Australian National University

Project Summary

The discovery of Homo floresiensis (the Hobbit) revealed the surprising diversity of early humans and opened new ways for Australians and Indonesians to make tremendous scientific advances. Deployment of world-best analytical capabilities to untapped speleothem resources in Indonesia will put us at the forefront in understanding global climate change, volcanic catastrophes, and environmental impacts on deep-time cultures shared by our nations. Our findings will extend to the modern world, where humans modify climates and landscapes at unprecedented rates. Integration of Australian and Indonesian research strengths will showcase bilateral science, education, and training, and engage the public in the excitement of scientific discovery.

DP1096862 Dr JT Gorgens

Approved Project Title **How do macroeconomic fluctuations affect the educational choices of young Australians? The 1990-1991 recession, recent evidence, and econometric issues**

2010 : \$ 72,000

2011 : \$ 72,000

2012 : \$ 70,000

Primary RFCD 3402 APPLIED ECONOMICS

Administering Organisation The Australian National University

Project Summary

The educational choices of young people are crucial for any nation's future. The project's empirical findings will inform public policy, particularly in the areas of education and training and youth unemployment. The research will help policy makers target people who need extra support in tough times and help determine the demand for different kinds of education. The findings have implications for future policies aimed at reducing inequality. The project's methodological contributions will lead to better and more reliable research in economics and other fields such as biology and engineering. The findings will be suitable for the top economics journals and contribute to Australia's standing in the academic community.

DP1094542 Prof RW Griffiths

Approved Project Title **Sensitivity and Change in the Global Ocean Overturning**

2010 : \$ 155,000

2011 : \$ 140,000

2012 : \$ 140,000

Primary RFCD 2604 OCEANOGRAPHY

Administering Organisation The Australian National University

Project Summary

The dynamics of the global, deep overturning circulation in the oceans and the way this adjusts to increasing greenhouse forcing will be examined in order to improve our conceptual knowledge of the oceans and the accuracy of climate models. By understanding how the ocean responds to changing surface heat and freshwater fluxes, and particularly the global role of rapid changes in high-latitude seas, we aim to help refine estimates of climate response times and the warming expected for a given increase in atmospheric greenhouse gases. These two important characteristics of the climate system underlie climate change policy decisions.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094742 Prof TR Griffiths; A/Prof MG Haward
Approved Project Title **Australia and the Antarctic Treaty System - A historical investigation**
2010 : \$ 115,000
2011 : \$ 95,000
2012 : \$ 68,000
Primary RFCD 4301 HISTORICAL STUDIES
Administering Organisation The Australian National University

Project Summary

The legitimacy of Australia's Antarctic claim rests not only on scientific work and a continuing physical presence, but on the level of Australia's cultural and political engagement with Antarctica. This research project will contribute, in a profound way, to the nation's international responsibilities to Antarctica. It will also contribute to a key policy priority of the Australian government, which is to strengthen its influence in the Antarctic Treaty System. In a very specific sense, the research will consolidate Australia's political, scientific and scholarly leadership in the international Antarctic community by contributing to the hosting of the 2012 Antarctic Treaty Consultative Meeting through a significant publication to be made available to all delegates.

DP1096870 Prof CP Groves; Dr WL JUNGERS; Ms DD Argue
Approved Project Title **Who were the ancestors of Homo floresiensis?**
2010 : \$ 97,000
2011 : \$ 150,000
2012 : \$ 100,000
Primary RFCD 3703 ANTHROPOLOGY
APD Ms DD Argue
Administering Organisation The Australian National University

Project Summary

The discovery of a tiny, new hominid species living in Indonesia until just 12,000 years ago, at the same time as modern humans in the region, has sparked world-wide public interest and debate. Finding the ancestors of this species will further promote Australian research as high profile, high calibre and cutting edge. Collaboration with researchers and institutions in Indonesia, USA, Kenya, Tanzania, South Africa and the Republic of Georgia will strengthen our links with these nations.

DP1097075 Prof AR Hajek
Approved Project Title **The Objects of Probabilities**
2010 : \$ 93,000
2011 : \$ 94,000
2012 : \$ 96,000
Primary RFCD 4401 PHILOSOPHY
Administering Organisation The Australian National University

Project Summary

Probabilities impact almost every aspect of our lives. Actuaries calculate probabilities of property loss due to bushfires, while climatologists warn that such probabilities will increase alarmingly. Probabilities abound in engineering, medicine, the law, the sciences and social sciences, and much philosophy. Yet we lack a proper understanding of the kinds of things that receive probabilities: the objects of probabilities. This project will provide such understanding. It will rethink the foundations of probability and decision theory, with potential ramifications for the philosophy, science, and public policy that are based on these theories. It thus aims to strengthen Australia's research profile and international standing in these areas.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093850 Prof AR Hardham; Dr DA Jones; Dr PN Dodds; Dr JG Ellis
Approved Project Title **Role of fungal secreted proteins as plant disease effectors**
2010 : \$ 110,000
2011 : \$ 110,000
2012 : \$ 110,000
Primary RFCD 2704 BOTANY
Administering Organisation The Australian National University

Project Summary

Many crop diseases are economically significant threats to agricultural productivity in Australia, with rust fungi in particular being a major problem for cereal grain production. Current methods of rust disease control are based on breeding for resistance but continued adaption by rust fungi to overcome plant defences means there is an urgent need for new methods of crop protection. This project will investigate molecular processes underlying fungal infection of plants, focusing on mechanisms that enable fungi to take over the metabolism of infected cells. The research will provide basic knowledge for development of novel and durable disease resistance strategies.

DP1093149 Prof RI Hartley; Mr R Shams; Prof Dr N Navab; Dr KG Vosburgh
Approved Project Title **Enhanced ultrasound-based imaging using image-based registration and acoustic impedance reconstruction**
2010 : \$ 95,000
2011 : \$ 90,000
2012 : \$ 85,000
Primary RFCD 2915 BIOMEDICAL ENGINEERING
APD Mr R Shams
Administering Organisation The Australian National University

Project Summary

The project will nurture the development of a new centre for medical image analysis work in Australia at the ANU. This is in line with the vision of ANU's Department of Engineering for the growth of biomedical engineering research. The project is directed at the creation of new surgical and imaging techniques based on ultrasound. These will have a direct effect on improved healthcare and new clinical procedures. The creation of a new ultrasound imaging modality will have commercial applications, enhancing the growth of biomedical engineering in Australia. The training of new PhD students and postdoctoral fellows will provide a basis for further development in this area, and its extension to other imaging research in Australia.

DP1095448 A/Prof A Hassell
Approved Project Title **The Spectral Theory and Harmonic Analysis of Geometric Differential Operators**
2010 : \$ 170,000
2011 : \$ 160,000
2012 : \$ 160,000
2013 : \$ 100,000
2014 : \$ 80,000
Primary RFCD 2301 MATHEMATICS
APF A/Prof A Hassell
Administering Organisation The Australian National University

Project Summary

The project will involve mathematical research of the highest international standard in two very active and far-reaching field of mathematics: quantum chaos, and harmonic analysis. Progress in these fields will have implications in areas such as communications technology (e.g. image compression), quantum theory, and mathematical analysis (e.g. partial differential equations).

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093048 A/Prof JM Healy; A/Prof MM Walton; Prof JB Braithwaite

Approved Project Title **Resolving patients' complaints about hospitals: Responsive regulation by health ombudsmen**

2010 : \$ 100,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 3602 POLICY AND ADMINISTRATION

Administering Organisation The Australian National University

Project Summary

Ombudsmen help ensure integrity and accountability in societal institutions. This study of patients' complaints about hospitals to health ombudsmen in two states, and the responses of hospitals, will produce evidence on strategies for making hospitals more responsive to the public and more accountable for the quality of their care. Australia was a world leader in establishing health ombudsmen and this study will explore their impact upon the hospital system. Evidence-based strategies are needed to improve the accountability of service providers and regulators. Social and economic benefits flow from empowering patients and from improving hospital performance.

DP1093516 Prof AF Hill

Approved Project Title **One coordinate carbon and boron: Universal progenitor ligands**

2010 : \$ 180,000

2011 : \$ 150,000

2012 : \$ 150,000

Primary RFCD 2502 INORGANIC CHEMISTRY

Administering Organisation The Australian National University

Project Summary

Compounds with bonds between metals and carbon (organometallic chemistry) underpin innumerable important industrial processes from fine chemicals to bulk agrochemical and polymer synthesis. Yet the simplest example, a single atom of carbon bound to a metal has only recently been discovered and is poorly understood. Australia's fledgling boron fine chemicals industry similarly benefits from metal-based processes. However, compounds with a single boron atom bound to a metal remain unknown. This proposal addresses metal-carbon and metal-boron chemistry from the most basic perspective, that of a single atom of boron or carbon, including the development of novel synthetic approaches and skills for the characterisation of such curious species.

DP1092445 Prof P Hiscock; Mr AC Mackay; Dr BM Chase

Approved Project Title **Technology and behavioural evolution in late Pleistocene Africa, Europe and Australia**

2010 : \$ 128,000

2011 : \$ 144,000

2012 : \$ 138,000

Primary RFCD 4302 ARCHAEOLOGY AND PREHISTORY

APD Mr AC Mackay

Administering Organisation The Australian National University

Project Summary

Many of the behaviours which distinguish Homo sapiens from other species first appeared in the late Pleistocene, raising the issue of whether our cognitive capacity changed significantly in this period. This project will use recent advances developed by Australian researchers to help resolve this cornerstone issue in human behavioural evolution. The project will also emphasise the importance of Australian archaeology to models of human evolution, redressing the peripheral role that the Pleistocene archaeology of the country is often accorded. In addressing these issues, the project will highlight Australia's commitment to core issues in human evolution, and deepen Australia's scientific ties with South Africa.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093797 Dr MJ Hole; Dr K McClements; Prof RL Dewar; Dr SD Pinches; Dr S Sharapov

Approved Project Title **Burning Plasmas: resolving energetic particle physics for the International Thermonuclear Experimental Reactor (ITER)**

2010 : \$ 95,000
2011 : \$ 90,000
2012 : \$ 100,000

Primary RFCD 2403 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PHYSICS

Administering Organisation The Australian National University

Project Summary

Fusion power is a zero greenhouse gas emitting technology, which if realised, offers millions of years of base-load electricity. This promise has prompted the international community to accelerate fusion energy development, principally via support of the next-step technology-enabling experiment, International Thermonuclear Experimental Reactor (ITER). Our project addresses a grand science challenge facing ITER and fusion power: can the products of reaction be kept confined and therefore self-heat the plasma? The answer will affect both the ITER program, and the viability of fusion power. This project provides a low-cost high-impact contribution to the science base for the \$16 billion ITER project, whilst growing Australian capability in this strategically important technology.

DP1093457 Dr JE Hope; Prof R Aoki; Prof R Gold

Approved Project Title **Creating and capturing value in biotechnology: Can organisations sustain themselves through open source-style licensing and collaboration?**

2010 : \$ 40,000
2011 : \$ 40,000
2012 : \$ 40,000
2013 : \$ 40,000
2014 : \$ 40,000

Primary RFCD 3901 LAW

Administering Organisation The Australian National University

Project Summary

Innovation is sometimes thought of exclusively in scientific and technological terms. But it is actually much broader, occurring in the way that commercial and non-commercial organisations seek to create and capture value - their business models. Like technological innovation, business model innovation is crucial to economic growth, but it is also fraught with uncertainty, complexity and risk. This project will engage with biotechnology organisations that are actively seeking to develop new business models in order to understand the innovative process and identify ways in which other actors can support their efforts through policy, funding and other interventions.

DP1096696 Prof TH Hull; Prof Z Zhao; Dr AC Hayes; Prof GW Jones; Dr PK Streatfield

Approved Project Title **Integrating population perspectives in Asian environmental debates**

2010 : \$ 130,000
2011 : \$ 130,000
2012 : \$ 130,000

Primary RFCD 3705 DEMOGRAPHY

Administering Organisation The Australian National University

Project Summary

Sustainable development in Asia is crucial for the future welfare of all Asians, and for Australia. The population of Asia is over 60 percent of global population and the region is rapidly urbanizing and industrializing, thus creating an ever more onerous environmental footprint. The economic analytical work underpinning the assessment and amelioration of environmental challenges in Asia has long utilized simple population projections. This project's methodologies will inform better policy and public debate to ensure that governments have more realistic understandings of the interaction between human population, human welfare and environmental integrity.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093003 Prof MG Humphrey; Dr MP Cifuentes; Dr SA Petrie; Prof Dr MJ Samoc; Prof KJ Clays

Approved Project Title **Organometallic Switches in Nonlinear Optics**

2010 : \$ 180,000
2011 : \$ 175,000
2012 : \$ 190,000
2013 : \$ 150,000
2014 : \$ 70,000

Primary RFCD 2599 OTHER CHEMICAL SCIENCES

ARF Dr MP Cifuentes

Administering Organisation The Australian National University

Project Summary

Investment in this project (i) will support Australia's research in an international group of researchers investigating materials (particularly NLO) properties of organometallic compounds, (ii) will involve training two PhD students, who will graduate with highly developed interdisciplinary skills, and (iii) may identify new materials with sufficient performance for commercial development.

DP1095637 Dr GA Huttley; Dr V Yap

Approved Project Title **Improving the accuracy of phylogenetic reconstruction by improving models of sequence divergence**

2010 : \$ 83,000
2011 : \$ 80,000
2012 : \$ 80,000

Primary RFCD 2702 GENETICS

Administering Organisation The Australian National University

Project Summary

Phylogenies describe the relationships among species and provide the essential framework for understanding evolutionary processes. They are an essential tool in the identification of functionally important regions in DNA sequences. An important aspect of identifying phylogenies is measuring how DNA sequences change in time. The proposed research will develop sophisticated, practical models of sequence divergence and make them freely available in open source software. The software and models will positively impact on studies seeking to understand Australian biological diversity. The proposed resolution of the eutherian mammal orders will further significantly impact on utilisation of rodents as a model organism for human biology.

DP1095142 Dr T Iizuka

Approved Project Title **Deciphering the early Solar System chronology and planetary chemistry using isotope systematics of meteoritic zircon**

2010 : \$ 110,000
2011 : \$ 115,000
2012 : \$ 100,000

Primary RFCD 2603 GEOCHEMISTRY

APD Dr T Iizuka

Administering Organisation The Australian National University

Project Summary

This project addresses the early evolution of our Solar System that is one of the most important questions in Earth and Planetary sciences. It will use Australia's meteorites and innovative analytical techniques developed in Australia. High impact scientific results produced in this project will be to the national benefit in terms of international recognition of our unique capability in this high profile and competitive research field. Furthermore, by providing new constraints on the initial state of geochemical evolution of the terrestrial planets, this work will further our knowledge of the subsequent evolution of the Earth's mantle and crust, leading to better models for Australian continent development and its deep-Earth resources.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094350 Prof RA Kennedy; Dr P Sadeghi

Approved Project Title **Signal Concentration, Robust Signal Processing and Information Theory on the Unit Sphere**

2010 : \$ 80,000

2011 : \$ 80,000

2012 : \$ 80,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Administering Organisation The Australian National University

Project Summary

This project will assist Australia in maintaining and elevating its international research role in the development of breakthrough signal processing techniques applied to mobile communication, geodesy, astronomy, defence and surveillance, and acoustic modeling of human hearing. The project's high impact contributions will advance Australia's knowledge base and through its applications attract industry interest particularly in the development of improved instrumentation. The publication of outcomes will elevate Australia's research reputation. The project provides high quality research training for gifted postgraduate students and postdoctoral researchers.

DP1096327 Prof YS Kivshar

Approved Project Title **Nonlinear nanophotonics**

2010 : \$ 145,000

2011 : \$ 130,000

2012 : \$ 130,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Organisation The Australian National University

Project Summary

This project will support world-leading research in nonlinear nanophotonics. It will develop theoretically and demonstrate experimentally novel concepts for confining and manipulating light in specially designed structures, making an essential step towards the creation of nanoscaled optical devices for storage, memory, and sensing. These developments will underpin the next generation of high-performance optical networks promising to revolutionize global communications. This research program will keep Australia at the forefront of international research and provide training for students in breakthrough applications of nanophotonics and nanotechnology, contributing to the uptake of frontier technologies by Australian industries.

DP1092891 Prof P Lam; Dr BC Buchler; Dr M Aspelmeyer; Prof V Sandoghdar; Prof A Furusawa

Approved Project Title **Quantum opto-mechanics with whispering gallery modes in crystalline materials**

2010 : \$ 120,000

2011 : \$ 90,000

2012 : \$ 90,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Organisation The Australian National University

Project Summary

Deep understanding and fine control of quantum phenomena will be increasingly important in 21st century technology. This Discovery Project aims to develop cutting edge expertise in ultra-precision machining for the realization of crystalline ring resonators that have very high optical and mechanical Q-factors. These structures will enable novel experiments in non-linear optics, quantum state generation, precision metrology and quantum opto-mechanical coupling. Results of our investigations will lead to compact devices for quantum information technologies, new geometries for single atom detection, and a deeper understanding of meso-scale quantum mechanical systems.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1097170 Prof DB Lindenmayer

Approved Project Title **An unprecedented opportunity to quantify biodiversity recovery after major wildfire**

2010 : \$ 368,738

2011 : \$ 250,687

2012 : \$ 310,621

2013 : \$ 273,194

2014 : \$ 296,099

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Organisation The Australian National University

Project Summary

Recent fire disasters in southern Australia emphasise that wildfire is one of the major social, economic and ecological issues facing the nation. Biodiversity loss and environmental degradation are also substantial national issues. The outcomes and new understanding obtained from this project will have enormous rural, regional, national and international benefits through developing better informed, and ecologically sustainable, principles and practices for biodiversity conservation, vegetation management, and fire management. It also will guide natural resource managers such as national park staff and state forest managers in best practice methods to manage post-fire ecological recovery on land under their jurisdiction.

DP1095302 Dr PD Londey; Dr CJ Mackie; Dr EH Minchin; Dr MM Ilhan; Prof JE Beaumont; Dr T Lewit

Approved Project Title **The silent wilderness speaks: the long history of Gallipoli and the Dardanelles**

2010 : \$ 107,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Organisation The Australian National University

Project Summary

When Charles Bean, with his Classical education, wrote about Gallipoli, he imagined it in the context of three millennia of wars and human lives. Bean's historical vision has been lost. Gallipoli has become increasingly important to Australians as a site of national memory and pilgrimage, yet the events of 1915 exist in a bubble, divorced from the historical landscape that spawned them. We will give back to Australians the long history of Gallipoli and the Dardanelles, placing a key part of Australia's history in its true geographical context: an area which has been lived in and regularly fought over for thousands of years. Given the significance attached to Gallipoli, the project will also enhance Australian-Turkish relations.

DP1095369 Prof B Luther-Davies

Approved Project Title **Rare Earth doped chalcogenide glass films for on-chip optical amplifiers**

2010 : \$ 125,000

2011 : \$ 110,000

2012 : \$ 130,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Organisation The Australian National University

Project Summary

The project will contribute to Australia's strong record of achievement in photonics technology. It has the potential to migrate photonic chip technology for all-optical processing from laboratory demonstrations to a commercially viable technology. If this is achieved commercialisation through a start-up company will become possible. All-optical processing is an advanced technology that will help increase the speed and the bandwidth of optical communications systems and the internet.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094622 Prof DC MacDougall; Dr R Chopra
Approved Project Title **Childhood and Modernity: Indian Children's Perspectives**
2010 : \$ 50,000
2011 : \$ 65,000
2012 : \$ 51,000
2013 : \$ 47,000
Primary RFCD 3703 ANTHROPOLOGY
Administering Organisation The Australian National University

Project Summary

This research, to be carried out in partnership with Indian institutions and scholars, will contribute to better public understanding of children's perspectives, rights, and social roles in India in an era of rapid change and globalisation. The focus on visual methods and collaboration with children will advance the methodologies of childhood research and produce knowledge valuable for a range of disciplines, from anthropology to history to cognitive science. The information gained will provide insights into the next generation of Indian adults, contributing to Australia's growing ties with India and the Asia-Pacific region.

DP1093431 Dr AD Mackey
Approved Project Title **Galaxy Archaeology with Globular Clusters in the Local Universe**
2010 : \$ 112,000
2011 : \$ 112,000
2012 : \$ 112,000
2013 : \$ 112,000
2014 : \$ 112,000
Primary RFCD 2401 ASTRONOMICAL SCIENCES
ARF Dr AD Mackey
Administering Organisation The Australian National University

Project Summary

Australia has a long and distinguished record of achievement in optical astronomy, and is rightly regarded as a world leader in the field. This Fellowship cements Australian involvement in several major new astronomical undertakings and will foster broad international collaborations - thus ensuring the high profile of Australian astrophysics is maintained, and providing strong return from a scientific field in which Australia has invested significant resources. This project will also contribute to inspiring public enthusiasm for science, as well as helping to produce skilled graduates. These aspects are crucial to the future prosperity of the Australian community.

DP1092706 Prof R Maleszka
Approved Project Title **Epigenetic integration of genomic and environmental information in honey bees**
2010 : \$ 145,000
2011 : \$ 145,000
2012 : \$ 145,000
2013 : \$ 135,000
Primary RFCD 2702 GENETICS
Administering Organisation The Australian National University

Project Summary

Environmental factors such as nutrition, drugs or childhood neglect alter gene activity without a change to the DNA code and may result in a range of conditions such as cancer, obesity and mental illness. Such epigenetic phenomena are driven by subtle and poorly understood modifications of the genome known as DNA methylation. Our aim is to study the link between DNA methylation and environmental influences. We aspire to understand how environmental signals trigger the reprogramming of transcriptional control of genetic networks that lead to contrasting phenotypic and behavioural outcomes using the honey bee model

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1092502 Prof RA Maller; Prof CC Klueppelberg

Approved Project Title **Stochastic analysis and the development and application of financial risk processes**

2010 : \$ 200,000
2011 : \$ 180,000
2012 : \$ 180,000
2013 : \$ 150,000
2014 : \$ 120,000

Primary RFCD 2302 STATISTICS

APF Prof RA Maller

Administering Organisation The Australian National University

Project Summary

Ensuring the stability of Australia's financial system requires an understanding of the complex financial instruments, strategies and technologies that have evolved in recent years. A strong well-integrated research effort in stochastic analysis with particular application to financial markets is fundamental for measuring and managing risk, to protect and preserve a well functioning system, and to inform policy debate on financial strategies and insurance liabilities.

These challenges are global and require extensive international research collaboration and interaction. The present project will enhance Australia's contributions in this area and facilitate its global impact more than is possible through individual efforts.

DP1094626 Prof I McAllister; Prof CS Bean; Prof RK Gibson; Dr JE Clark

Approved Project Title **The 2010 Australian election study: The dynamics of political choice**

2010 : \$ 45,000
2011 : \$ 45,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Organisation The Australian National University

Project Summary

In addition to providing an in-depth understanding of general patterns of Australian voting behaviour, the 2010 Australian Election Study (AES) will provide a detailed, objective account of how and why voters made up their minds in the 2010 federal election. The 2010 AES adds to the unbroken series of national election surveys conducted after each Australian federal election since 1987. These surveys provide an unrivalled resource for moving beyond impressionistic accounts of political behaviour. The survey will enable researchers to determine what citizens think of politics and the processes that produce a government, and to understand how and why mass political attitudes have changed over a quarter of a century.

DP1092556 Prof DE McClelland; A/Prof SM Scott; Dr SE Whitcomb; Prof N Mavalvala; Dr R Schnabel; Prof B Owen

Approved Project Title **Probing the Universe with gravitational waves: from cutting-edge technology to astronomy**

2010 : \$ 130,000
2011 : \$ 130,000
2012 : \$ 150,000

Primary RFCD 2404 OPTICAL PHYSICS

Administering Organisation The Australian National University

Project Summary

The direct detection of Einstein's elusive gravitational waves will not only confirm one of the most important theories in physics, it will unleash a new form of radiation (in addition to electromagnetic) with which to study the Universe. Our participation in this quest continues Australia's role in the vanguard of new astronomy and its exploitation. This proposal will produce scientists highly trained in areas of national priority, including frontier technologies such as photonics and smart information use through GRID computing. Developing ways to build instruments of almost unimaginable sensitivity fosters innovation leading to spin-offs into other areas of optical sensing - fundamental research resulting in economic benefit.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094677 Dr D McPhail; Dr MD Norman; Dr SA Wakelin; Dr CH Stirling; Dr TK Kyser
Approved Project Title **Biogeochemical drivers of uranium isotope fractionation in regolith and groundwater**
2010 : \$ 140,000
2011 : \$ 120,000
2012 : \$ 120,000
Primary RFCD 2603 GEOCHEMISTRY
Administering Organisation The Australian National University

Project Summary

Water and soil resources are critical to Australia's present and future health and wealth. This project provides necessary data to increase our understanding groundwater recharge, flow and quality, weathering rates and uranium behaviour in soil and water. It will help delineate the impacts of agricultural activities and climate change. It may also trigger the development of new mineral exploration strategies for uranium and other commodities.

DP1093438 Dr M Mietzner
Approved Project Title **Political party financing and democratic consolidation in Indonesia**
2010 : \$ 36,000
2011 : \$ 24,000
2012 : \$ 24,000
Primary RFCD 3601 POLITICAL SCIENCE
Administering Organisation The Australian National University

Project Summary

As Australia's vast neighbour to the north, Indonesia, is of critical importance to Australian national interests. Particularly essential in this regard is the stability of Indonesia's young democracy, which is increasingly threatened by the widespread perception that party politics are contaminated by corrupt, greedy and self-centred politicians. This sentiment is largely fuelled by complaints about questionable fundraising practices of political parties. Accordingly, this study will be of great interest to Australian policy-makers, aid officials and businesses that wish to address the deficiencies in Indonesia's political system through political and economic cooperation programs.

DP1093519 Dr L Narangoa; Dr RB Cribb
Approved Project Title **'Puppet States' Revisited: Empire and Sovereign Subordination in Modern Asia**
2010 : \$ 113,000
2011 : \$ 127,000
2012 : \$ 110,000
Primary RFCD 4301 HISTORICAL STUDIES
Administering Organisation The Australian National University

Project Summary

The term 'puppet state' is a part of public discourse in Australia. It is used by scholars, journalists, commentators and members of the public to characterize specific international relationships in the contemporary world. While being used as an analytical term, it carries a strong pejorative connotation. This project will contribute significantly to giving the term clarity and stability of meaning that will enhance the quality of public discussion of international affairs and lead to a more informed approach to safeguarding Australia. The insights we generate by this comparison will illuminate the controversial contemporary issue of international intervention in the territory of sovereign states.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093094 Prof A Neeman

Approved Project Title **Triangulated categories and their applications**

2010 : \$ 225,000
2011 : \$ 205,000
2012 : \$ 230,000
2013 : \$ 180,000
2014 : \$ 100,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

This project is at the cutting edge of modern, international research in mathematics. Having work of this calibre done in Australia raises our international prestige, and makes Australia a more attractive place for top-notch hi-tech companies. Furthermore, training our young people to such a high standard will have the long-term effect of raising our profile.

DP1093767 Dr DN Neshev

Approved Project Title **Nanoscale nonlinear optics**

2010 : \$ 140,000
2011 : \$ 130,000
2012 : \$ 130,000
2013 : \$ 90,000
2014 : \$ 65,000

Primary RFCD 2404 OPTICAL PHYSICS

QEII Dr DN Neshev

Administering Organisation The Australian National University

Project Summary

Advances in nanotechnology have led to the realisation of nanoscale photonic components that enable integration within electronic chips. Now the challenge is to make these components perform computing functions themselves, thus providing ultra-high operation speeds and reducing power consumption. This project will utilize the intensity dependent interaction of light with metal-dielectric nanostructures to establish new processing functions of the photonic components. Our research underpins integration of photonics in future generations of computers and enables novel applications in subwavelength optical imaging and sensing. This project will therefore strongly enhance the standing of Australia in the field of nanotechnology.

DP1096487 Dr S Okada

Approved Project Title **Stability conditions on triangulated categories and related aspects of homological mirror symmetry**

2010 : \$ 85,000
2011 : \$ 85,000
2012 : \$ 85,000

Primary RFCD 2301 MATHEMATICS

APD Dr S Okada

Administering Organisation The Australian National University

Project Summary

The proposed research studies one of the deepest questions in nature through superstring theory and mathematics with leading experts around the world. So, the proposed project maintains the Australia's profile in science. Also, the proposed project fits within the the Research Priority: Frontier Technologies for Building and Transforming Australian Industries. We will have exciting mathematical discussions which stimulate Australian students. They will be able to take advantage of such experience, especially when they need innovation. Thus, it is an investment for future of Australian industries.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1094128 Prof HS O'Neill; Prof IH Campbell
Approved Project Title **The high temperature geochemistry of the precious metals**
2010 : \$ 100,000
2011 : \$ 90,000
2012 : \$ 100,000
Primary RFCD 2603 GEOCHEMISTRY
Administering Organisation The Australian National University

Project Summary

Many commercially valuable elements including platinum and gold are extracted from magmas into sulphide melts under some conditions whose nature is poorly understood. The proposed research will make the first reliable measurements of the factors controlling the ability of sulphide melts to extract a range of sulphur-loving elements from magmas. The results will not only aid the search for new deposits of precious metals, but will provide fundamental knowledge for use in such diverse disciplines as extractive metallurgy and planetary geochemistry.

DP1092801 Prof TJ O'Neill; Prof RD Terrell; Prof AH Welsh; Dr J Penm; Dr J Penm; Prof CC Li; Prof A Chen
Approved Project Title **The improvement of climate change investigations by developing and applying innovative evolutionary subset time series modelling using semi-parametric sparse-patterned approaches**
2010 : \$ 110,000
2011 : \$ 100,000
2012 : \$ 90,000
Primary RFCD 2302 STATISTICS
Administering Organisation The Australian National University

Project Summary

With an estimated US\$6.98 trillion loss indicated in the Stern review, severe climate change will make world climate conditions harsher and more likely include large natural climate disasters. The health of the Australian economy is critically dependent on decisions of environmental managers. However, most problems of complexity arising in climate change involve issues on which we do not possess a deep understanding. This project draws upon a set of inter-disciplinary concepts and models centred in neural networks that enable us to advance our understanding of complexity, leading to superior quantitative tools and models to allow for improved environmental decision-making.

DP1094453 Prof R Peakall; Dr RA Barrow; Prof E Pichersky
Approved Project Title **The chemical, biochemical, genetic and ecological basis of pollinator-driven speciation in Australian sexually deceptive orchids**
2010 : \$ 105,000
2011 : \$ 105,000
2012 : \$ 105,000
Primary RFCD 2707 ECOLOGY AND EVOLUTION
Administering Organisation The Australian National University

Project Summary

The Australian biota offers unique opportunities for illuminating ecological and evolutionary processes of worldwide importance. Focussing on Australian sexually deceptive orchids, this study offers a model system for studies of plant speciation that has already captured the interest of the public, educators and scientists around the world. The project will produce multiple graduate students with high quality, cross-disciplinary training. Expertise and tools developed will contribute directly to the conservation of endangered Australian orchids. Thus the knowledge obtained from this research will have immediate practical benefits for the sustainable use of Australia's biodiversity.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096147 Prof PA Pickering; Dr K Bowan

Approved Project Title **Sounds of Empire: Popular Politics and Music in the Nineteenth Century**

2010 : \$ 100,000
2011 : \$ 117,000
2012 : \$ 90,000

Primary RFCD 4301 HISTORICAL STUDIES

APD Dr K Bowan

Administering Organisation The Australian National University

Project Summary

This research will critically locate Australia within a global system of cultural transmission and showcase a significant innovation in methodology through an interdisciplinary approach. This will provide an opportunity to bring to light Australia's role in the transmission of popular politics and culture to a broader international audience. It will make a direct and immediate contribution to Australian studies by examining in depth the transmission, adaption and encounter of musics in the making of the nation. Many of the ideas that shape our modern democracy were brought informally in speeches and songs. A better understanding of the ways and means of their transmission brings us to a deeper appreciation of Australia's past and present.

DP1094638 A/Prof GD Price; Prof MR Badger; Prof CA Kerfeld

Approved Project Title **How do nano-molecular carboxysome protein structures function in alpha and beta-cyanobacteria and can we use them for novel reaction compartmentalisation?**

2010 : \$ 115,000
2011 : \$ 106,000
2012 : \$ 106,000

Primary RFCD 2704 BOTANY

Administering Organisation The Australian National University

Project Summary

In blue-green algae, protein nano-structures, known as carboxysomes, act as tiny compartments where carbon dioxide (CO₂) can be fixed into simple sugars at high efficiency. This important photosynthetic process forms the basis of global primary productivity on this planet, but most land-based CO₂ fixation lacks the efficiency seen in blue-greens. This research aims to determine how the proteins that make up carboxysomes are 3-dimensionally arranged and how these structures function to enhance rates of CO₂ fixation. A more thorough understanding of the carboxysome is likely to have potential applications in industrial nano-technology and improve our understanding of oceanic primary productivity.

DP1097164 Dr ND Ramsey

Approved Project Title **War, Literary Culture and Masculinity in Romantic Period Britain, 1750-1850**

2010 : \$ 93,500
2011 : \$ 88,000
2012 : \$ 80,182

Primary RFCD 4202 LITERATURE STUDIES

APD Dr ND Ramsey

Administering Organisation The Australian National University

Project Summary

The Romantic period represents a formative moment in the history of Australia and my reconsideration of Romantic culture and war has relevance for understanding this history. Australia's own experience of war first originated with the frontier wars of 1788-1838. My research into British Romantic military and naval war writing will provide key insights into the military culture that dominated this formative moment of Australian military history. War has, more broadly, been pivotal in the formation of Australian nationhood and identity. My project will contribute to our understanding of the role of war in Australian culture by providing fresh insight into the historical role of war writing in constructing modern forms of identity.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093910 Dr D Ridout

Approved Project Title **Indecomposable Structure in Representation Theory and Logarithmic Conformal Field Theory**

2010 : \$ 120,000

2011 : \$ 120,000

2012 : \$ 120,000

2013 : \$ 105,000

2014 : \$ 105,000

Primary RFCD 2301 MATHEMATICS

ARF Dr D Ridout

Administering Organisation The Australian National University

Project Summary

Logarithmic conformal field theory describes non-local observables in statistical models of important physical systems (eg. polymers, percolation). This realisation has led to a recent explosion of activity among physicists and mathematicians. Mathematical physics in Australia is well-placed to capitalise on this activity, having several experts working in the area, and this project will significantly augment Australia's reputation within the international community by bringing (and developing) mathematical tools and insights which complement current research strengths. Such augmentations are vital to the well-being of mathematics and physics in Australia.

DP1095337 Prof GE Russell; Prof JA Mee

Approved Project Title **Sociability, print and public culture in romantic period Britain and Australia**

2010 : \$ 170,000

2011 : \$ 140,000

2012 : \$ 155,000

2013 : \$ 80,182

2014 : \$ 80,182

Primary RFCD 4202 LITERATURE STUDIES

APF Prof GE Russell

Administering Organisation The Australian National University

Project Summary

This project illuminates the life in the early colony by exploring the history of the earliest Australian printed document that has so far been discovered, a playbill for a theatrical performance in Sydney dating from 1796. Placing the document in a rich and complex context of print, circulation, and sociability, the project affirms the importance of such ephemeral literature as testimony to the values of fellowship and community that were foundational to Australian culture and which continue to be relevant to the health of a modern democracy.

DP1094655 Dr I Shadrivov

Approved Project Title **Nonlinear metamaterials and transformation optics**

2010 : \$ 150,000

2011 : \$ 150,000

2012 : \$ 140,000

2013 : \$ 130,000

2014 : \$ 130,000

Primary RFCD 2405 CLASSICAL PHYSICS

QEII Dr I Shadrivov

Administering Organisation The Australian National University

Project Summary

This research program will bring Australia to the forefront of international research in the exciting area of nonlinear metamaterials. It will provide high-level training for students in breakthrough science directions, and contribute to the uptake of frontier technologies by Australian industries for successful operation in a competitive global environment. This project will introduce and demonstrate novel concepts for dynamically controlling and manipulating the properties of new type of materials. This research should bridge a gap between the study of metamaterials as a theoretical curiosity and their advanced applications. Our developments will underpin future developments in imaging systems and security.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1095981 Dr Y Sheng
Approved Project Title **Optical parametric processes in randomized nonlinear photonic structures**
2010 : \$ 140,000
2011 : \$ 100,000
2012 : \$ 100,000
Primary RFCD 2404 OPTICAL PHYSICS
APD Dr Y Sheng
Administering Organisation The Australian National University

Project Summary

This project will have an impact on understanding of the nonlinear optical effects in micron and sub-micron structures providing knowledge for potential practical applications. Innovative ideas emanating from this program will increase the national and international standing of the ANU and strengthen the reputation of Australia in the field of nonlinear photonics. The project will expand existing and create new collaborative links with high profile international partners. It will also provide training and experience in the cutting edge research for graduate and undergraduate students.

DP1097048 Prof K Sterelny; Dr B Calcott
Approved Project Title **Evolvability and the Evolution of Complexity**
2010 : \$ 91,700
2011 : \$ 86,000
2012 : \$ 89,000
Primary RFCD 4401 PHILOSOPHY
APD Dr B Calcott
Administering Organisation The Australian National University

Project Summary

Anyone engaging in a moment's reflection on the striking richness, diversity, and complexity of the biological world is faced with the question: how did it get here? Though natural selection is central to answering this question, important new work has identified various conditions that make some lineages of organisms "evolvable": capable of changing in ways that radically expand the range of further possible changes. This project will clarify and integrate these various conditions using empirical examples and simple models. The resulting work from this project will provide a clearer general understanding of what biological complexity is, and how science has compelling candidates for understanding how it evolves.

DP1095319 Dr E Subasic; Dr KJ Reynolds; Prof P 't Hart; Prof SD Reicher; Prof SA Haslam
Approved Project Title **Leadership, social identity and the dynamics of influence in intergroup relations: A new understanding of social continuity and social change**
2010 : \$ 120,137
2011 : \$ 120,137
2012 : \$ 120,137
2013 : \$ 100,137
Primary RFCD 3801 PSYCHOLOGY
APD Dr E Subasic
Administering Organisation The Australian National University

Project Summary

Understanding how social change occurs (or continuity prevails) and the role of leadership in this process is paramount to any social system (e.g. nation, state, organization, team). This project provides a new social psychological understanding of leadership and social change dynamics, including when more radical leaders and social relations emerge, as well as how different groups become more united around a common cause. Given ethnic, religious, social and political diversity of Australian society, these questions are fundamental to strengthening Australia's social fabric. This research also has cross-disciplinary applications, builds international collaborations, and supports emerging Australian research talent.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096754 Dr HH Tan; Dr Q Gao; Dr MB Johnston

Approved Project Title **Integration of III-V semiconductor nanowires on silicon platform**

2010 : \$ 170,000
2011 : \$ 160,000
2012 : \$ 160,000
2013 : \$ 130,000
2014 : \$ 120,000

Primary RFCD 2404 OPTICAL PHYSICS
ARF Dr Q Gao

Administering Organisation The Australian National University

Project Summary

This proposal is at the forefront of nanoscience and nanotechnology. The outcomes are expected to be of great interest to a broad spectrum of industry sectors and academic researchers, including optical communications and microelectronics industries, biological and chemical sensing and national health. This novel material system will be used for the next generation of photonic/electronic devices and to develop advanced 3D optoelectronic integrated circuits. The success of this project will enhance Australia's international scientific reputation, stimulate local expertise, and help create vibrant new industries.

DP1094303 Prof NS Trudinger; Prof X Wang

Approved Project Title **Nonlinear elliptic partial differential equations and applications**

2010 : \$ 142,960
2011 : \$ 130,000
2012 : \$ 170,000

Primary RFCD 2301 MATHEMATICS

Administering Organisation The Australian National University

Project Summary

Many fundamental advances in modern technology, science and economics are driven by the analysis of nonlinear models based on nonlinear partial differential equations. In recent years there has been increasing use in applications of partial differential equations of elliptic type with major discoveries made and longstanding problems resolved by the two Chief Investigators, who have in return received many international accolades. This project provides for the continuation of Australian leadership in key strategic areas of international science, such as optimal transportation, as well as the continued building of related expertise and training.

DP1096041 Dr C Turner; Dr MM Antoinette

Approved Project Title **The rise of new cultural networks in Asia in the twenty-first century**

2010 : \$ 135,000
2011 : \$ 115,000
2012 : \$ 95,000

Primary RFCD 4199 OTHER ARTS
APD Dr MM Antoinette

Administering Organisation The Australian National University

Project Summary

Understanding Asia's dramatically changing cultural climate is fundamental to Australia's future cultural engagement with the region, consistent with the National Research Priority goal to 'understand our region and the world'. This project will document and improve understanding of new Asian art and art museum-related cultural networks, shedding light on their regional and global profiles and interactions. It will enhance understanding of Australia's role in creative industries and networks in Asia, providing a platform for future Australian policy and participation in these networks. Such knowledge will build Australia's research base on Asian art, museums and culture, and enhance Australia's collaborations and connectivity with Asia.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1093331 Dr M Vos; Prof E Weigold; Prof WS Werner; Dr A- Winkelmann; Dr GA Van Riessen
Approved Project Title **High-energy electron scattering of surfaces: new spectroscopies and new physics**
2010 : \$ 120,000
2011 : \$ 120,000
2012 : \$ 110,000
Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS
APD Dr GA Van Riessen
Administering Organisation The Australian National University

Project Summary

Electrons sometimes behave as particles, and sometimes as waves. Both aspects are used when investigating nano-structures with electron beams. In this research program we design and perform experiments to measure sample composition using the particle nature, and the atom positions by using the wave nature of electrons. These novel experiments, using unique spectrometers designed and developed in Australia, are aimed at making new forms of electron microscopy possible, but will also result in a better understanding of existing electron microscopies and synchrotron-based measurements.

DP1094868 Dr PD Waters; Dr JE Deakin; Prof JA Graves
Approved Project Title **Epigenetic silencing in vertebrates: evolution and function from the bottom-up**
2010 : \$ 110,000
2011 : \$ 105,000
2012 : \$ 100,000
Primary RFCD 2702 GENETICS
Administering Organisation The Australian National University

Project Summary

The primary benefits are contribution to Australia's knowledge base and raising the profile of functional genomics in Australia, with the research priority of Frontier Technologies for Building and Transforming Australian Industries and priority goals in Breakthrough Science and Frontier Technologies. This project focuses on important biological questions surrounding gene regulation and sex chromosome evolution. International attention has already resulted in genome characterization of Australian icons (wallaby, Tasmanian devil and platypus), more research on these, and other Australian animals, will further highlight the importance of Australian fauna and impact positively on our scientific profile.

DP1095725 Prof RC Williamson; Dr R Herbrich; Dr U von Luxburg; Prof Dr P Grunwald
Approved Project Title **Reconceiving Machine Learning**
2010 : \$ 100,000
2011 : \$ 100,000
2012 : \$ 100,000
Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING
Administering Organisation The Australian National University

Project Summary

The proposed research will develop a new way to consider problems to which machine learning can be applied. Machine learning is crucial enabler of the digital economy. The research will provide better opportunities for Australian industry to gain a competitive advantage with machine learning technology. The framework developed will enable better opportunities for collaborative research and will build and strengthen international linkages.

Summary of Discovery Projects Proposals for Funding to Commence in 2010

DP1096918 Dr J Ye
Approved Project Title **Development of high performance wide-bandgap polar oxide electronic and optoelectronic devices**
2010 : \$ 170,000
2011 : \$ 170,000
2012 : \$ 170,000
2013 : \$ 150,000
2014 : \$ 120,000
Primary RFCD 2909 ELECTRICAL AND ELECTRONIC ENGINEERING
QEII Dr J Ye
Administering Organisation The Australian National University

Project Summary

The research and development of high performance electronic and optoelectronic devices based on polar semiconductors have numerous practical applications in future communication systems and power electronic network. This project aims to generate exciting breakthrough science for novel polar oxide devices. The technologies developed through this project may lead to immediate applications and commercialization of high performance devices in sensing, detection and communication, bringing enormous economic benefit for the Nation. The international collaboration will provide invaluable resources for both scientific research and technology development and keep Australia at the forefront in this field.

DP1092870 A/Prof GC Young; Prof JA Long; A/Prof TJ Senden; Dr KM Trinajstic; Dr CJ Burrow; Prof Dr M Zhu; Prof CR Marshall
Approved Project Title **Origin of jaws - the greatest unsolved mystery of early vertebrate evolution**
2010 : \$ 150,000
2011 : \$ 110,000
2012 : \$ 110,000
Primary RFCD 2601 GEOLOGY
Administering Organisation The Australian National University

Project Summary

The 2008 discovery of an unborn embryo in the 380 million-year-old "Mother Fish" from the famous Gogo fossil deposit in NW Australia has attracted a collaboration of Australian, American and Chinese scientists to a new international collaboration. The team will study spectacular new fossils from central Australia and southern China, the oldest known back-boned animals with jaws and a hard skeleton. Innovative 3D X-ray computer tomography, and the Australian synchrotron, will be used to investigate ancient cells and preserved soft tissue structures, to search for evidence that copulation and internal fertilization, as in modern mammals, might have originated when jaws first evolved.