

**Western Australia**

**The University of Western Australia**

**DP0984540** Dr J Bamberg; Dr MR Giudici; A/Prof GF Royle

**Approved Project Title** **Permutation groups and their interplay with symmetry in finite geometry and graph theory**

**2009 :** \$ 109,000  
**2010 :** \$ 89,000  
**2011 :** \$ 89,000  
**2012 :** \$ 109,000  
**2013 :** \$ 99,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** The University of Western Australia

**Project Summary**

A strong mathematical community in Australia provides the foundations for future discoveries in technology, science and business. The use of group theory to characterise symmetric generalised quadrangles, partial quadrangles, and strongly regular graphs, and the construction of new examples of such objects, will enhance Australia's leading position in Group Theory, Algebraic Graph Theory and Finite Geometry. This project will also strengthen the collaboration between Australian, Belgian and Italian Universities and support young researchers, developing expertise in a world-leading research group, to drive Australia's future in mathematics.

**DP0988326** Prof ME Barley; A/Prof SD Golding; Dr M Fiorentini

**Approved Project Title** **The early evolution of the Earth system from multiple sulfur isotope records of sediments and seafloor mineral systems**

**2009 :** \$ 70,000  
**2010 :** \$ 70,000  
**2011 :** \$ 70,000

**Primary RFCD** 2603 GEOCHEMISTRY

**Administering Organisation** The University of Western Australia

**Project Summary**

This project addresses the early evolution of the Earth system that is one of the most important questions in Earth Sciences. It will use Australia's unique rock record and analytical techniques developed in Australia in collaboration with leading international researchers. The National Research Priority area 'An environmentally sustainable Australia: developing deep Earth resources' will benefit through the development of better exploration models for Archaean submarine metal deposits. Students will obtain a high level understanding of the early Earth system, ore deposits, stable isotope and transition metal geochemistry, which are directly applicable in both pure and applied research and mineral exploration.

**DP0988288** Dr DM Bayliss; Dr CR Jarrold

**Approved Project Title** **Memory Consolidation and Educational Achievement in Children**

**2009 :** \$ 60,000  
**2010 :** \$ 40,000  
**2011 :** \$ 50,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Western Australia

**Project Summary**

The National Report on Schooling in Australia 2006 reports that between 7-12% of children in Years 3 and 5 failed to meet literacy and numeracy benchmarks. Evidence suggests that poor working memory skills may be a key feature in children's failure to achieve in school. By investigating the cognitive factors that underlie variation in working memory ability, the proposed research has the potential to improve educational outcomes in Australian children. If memory consolidation is found to be important, this would guide the development of effective teaching strategies and early intervention programs for 'at-risk' children in line with the National Literacy and Numeracy Plan.

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

**DP0986318** Prof SJ Berners-Price; Dr A Filipovska

**Approved Project Title** **Gold-based mitochondria targeted chemotherapeutics: mechanistic studies probing interactions with thiol and selenol containing proteins**

**2009 :** \$ 130,000

**2010 :** \$ 90,000

**2011 :** \$ 110,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Organisation** The University of Western Australia

### Project Summary

Cancer affects one in four Australians and prostate cancer is the most commonly diagnosed and second leading cause of male cancer deaths, for which there is currently no effective treatment. Current chemotherapeutics must overcome drug resistance and lack of selectivity between tumour and normal cells. To circumvent these problems we are investigating gold-based compounds, which act by a novel mechanism. The research will lead to new strategies in the design of improved anticancer drugs, an important Australian research priority that will promote and maintain good health. Other benefits arise from training PhD students with interdisciplinary skills for Australian biotechnology industries.

**DP0988781** Prof MB Bush; Dr BR Lawn

**Approved Project Title** **Failure of Worn Tooth Structures**

**2009 :** \$ 172,000

**2010 :** \$ 142,000

**2011 :** \$ 142,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

Layer structures are replete in biological systems, both natural and artificial. Issues concerning the lifetime of such systems are paramount to the quality of life and economic well being of our aging society. Our project will analyse damage in brittle layer systems that simulate natural teeth and dental crown structures that have been subject to wear. The project is connected to the dental community and international crown material manufacturers through a broader National Institutes of Health project in the USA. The improved understanding of damage mechanisms in natural teeth and crown designs resulting from this project will have impact worldwide, including Australia.

**DP0988706** Prof L Cheng; Dr M Zhao

**Approved Project Title** **Scour and scour protection around gravity anchors**

**2009 :** \$ 60,000

**2010 :** \$ 60,000

**2011 :** \$ 50,000

**Primary RFCD** 2907 RESOURCES ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

The costs for scour protection around gravity anchors in a typical offshore project are in the order of 10-20 million dollars. With the increasing number of gravity anchors being installed in Australian waters, significant cost savings are expected to be achieved through improved understanding of local scour and scour protection around gravity anchors. The outcomes of this project can be applied directly to the design of new large diameter pipelines, will lead to reduction of scour protection costs and enhancement of safety of the pipeline to be stabilized, and increase the competitiveness of Australian oil and gas industry.

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

**DP0988940** Prof AJ Deeks  
**Approved Project Title** **Efficient reinforced concrete design using linear elastic finite element analysis**  
**2009 :** \$ 130,000  
**2010 :** \$ 110,000  
**2011 :** \$ 110,000  
**Primary RFCD** 2908 CIVIL ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

It is expected that this project will bring about changes in the design practice for reinforced concrete structures, particularly those of complex geometry, which will enhance the competitiveness of the Australian design community. Through reduction of the overuse of concrete often present in current conservative design procedures for such structures, the project will lead to a reduction in the impact of reinforced concrete construction on the environment and contribute to sustainable engineering practise.

**DP0988424** Dr KD Do  
**Approved Project Title** **Coordination control of underactuated ocean vehicles for ocean forecasting**  
**2009 :** \$ 122,000  
**2010 :** \$ 100,000  
**2011 :** \$ 98,570  
**2012 :** \$ 102,370  
**2013 :** \$ 98,570  
**Primary RFCD** 2301 MATHEMATICS  
ARF Dr KD Do  
**Administering Organisation** The University of Western Australia

### Project Summary

Australia is surrounded by oceans. Ocean forecasting is essential for effective and efficient operations on and within the ocean for a number of applications such as coastal zone management, military operations and scientific research. The successful completion of this project promises to put Australia in a leading position in this area. Due to the multi-disciplinary nature of this project, the project development will also stimulate the development in many other areas such as new ocean vehicles, sensors and actuators, electronics and control.

**DP0988449** Prof AV Dyskin; Dr E Pasternak; Prof E Pelinovsky  
**Approved Project Title** **Energy dissipation and vibration-assisted self-healing in structures with topological interlocking**  
**2009 :** \$ 110,000  
**2010 :** \$ 80,000  
**2011 :** \$ 80,000  
**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

High dissipation of impact and vibration energy, vibration-assisted self-healing, high tolerance to block failure and an ease of assembly/disassembly make topological interlocking structures ideal for safety barriers, protective shields and floating structures. The theory of these phenomena will open a way for more efficient protection of infrastructure against both natural and human perpetrated impacts and for developing new methodology in constructing mobile marine bases. This constitutes the main benefit of the project. Furthermore, understanding the resonance structure of travelling waves will improve methods of non-destructive monitoring by back analysing spectral signatures of the waves.

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

**DP0985859** Dr F Garcia-Gonzalez

**Approved Project Title** **The evolution of female multiple mating: genetic benefits and indirect genetic effects**

**2009 :** \$ 140,000  
**2010 :** \$ 140,000  
**2011 :** \$ 140,000  
**2012 :** \$ 100,000  
**2013 :** \$ 100,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**ARF** Dr F Garcia-Gonzalez

**Administering Organisation** The University of Western Australia

### Project Summary

This work will yield results at the forefront of evolutionary biology, thereby contributing to Australia's reputation as a country where excellent and original research is conducted. A greater understanding of the processes determining offspring viability, paternity success, and the acquisition of genetic quality will also benefit animal breeding and conservation biology. My research will work towards a better understanding of an ecologically important Australian native coastal species which supports commercial fisheries. Australian science will further benefit from the training of young scientists and from collaborations with international researchers that will promote excellence in Australian research.

**DP0988904** Dr S Gourvenec; Prof MF Randolph

**Approved Project Title** **Shallow foundation solutions for offshore oil and gas facilities**

**2009 :** \$ 178,000  
**2010 :** \$ 156,000  
**2011 :** \$ 150,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

This research will develop reliable predictions of limit loads for offshore skirted shallow foundations to replace current industry design guidelines that are excessively conservative. This project has direct application to the design of the range of established skirted shallow foundation systems for offshore structures as well as new concept hybrid production platforms and liquefied natural gas terminals designed to be buoyant after offloading, thus imparting a sustained uplift on the foundation. The direct economic benefit of this research would be in the region of \$3-5M per project. Continued development of Australia's offshore resources will provide jobs for many Australians and sustain an essential market of the Australian economy.

**DP0984220** Prof YA Haskell

**Approved Project Title** **Mapping the Latin Enlightenment: Centres and Peripheries**

**2009 :** \$ 83,000  
**2010 :** \$ 130,000  
**2011 :** \$ 35,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Organisation** The University of Western Australia

### Project Summary

An Australian will lead an international team to reclaim the massive but neglected Latin-language culture of 18th-C Europe, restoring 'lost' authors influential in their day and assessing the contribution of Latin literary and scientific networks to Enlightenment culture. Our national conversation on the Enlightenment will expand from a near-exclusive focus on France and England to Italy and the Netherlands, countries of historical importance to Australia and our region. The project will further enhance Australia's high reputation in Italian literature studies, setting a new direction in the field by tracking the influence of Latin humanism beyond the Renaissance. Outcomes include a monograph, critical anthologies, and research training.

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

**DP0985418** Dr JL Heazlewood

**Approved Project Title** **Plant Mitochondrial Signalling and Regulation**

**2009 :** \$ 117,220  
**2010 :** \$ 117,220  
**2011 :** \$ 117,220  
**2012 :** \$ 117,220  
**2013 :** \$ 117,220

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY  
QEII Dr JL Heazlewood

**Administering Organisation** The University of Western Australia

### Project Summary

Plant energy production is essential for successful growth and development and is essential for processes such as seedling establishment and germination. This research project intends to expand our understanding of energy regulation within the plant using advanced technologies. Such studies can provide direct benefits to the Australian agriculture community through novel targets for genetic improvements. The capacity to create such advantages is economically vital for the industry and the development of such expertise within Australia will ensure we are well placed to exploit future advances in agricultural improvements and provide the capacity to further generate novel biotechnological applications.

**DP0985221** Prof GN Ivey; Dr RJ Lowe; Prof CB Pattiaratchi

**Approved Project Title** **Transient coastal upwelling along Western Australia: The dynamics of the Ningaloo Current system**

**2009 :** \$ 200,000  
**2010 :** \$ 80,000  
**2011 :** \$ 80,000

**Primary RFCD** 2604 OCEANOGRAPHY

**Administering Organisation** The University of Western Australia

### Project Summary

This project will lead to significant advances in our understanding of the Ningaloo Current system that dominates the regional circulation surrounding Ningaloo Marine Park, part of the National Representative System of Marine Protected Areas. The numerical model and field measurements will, for the first time, elucidate which physical factors drive the Ningaloo Current and the resulting spatial and temporal variability of upwelling. This will ultimately provide insight into how various ecological processes are linked to hydrodynamics (e.g., nutrient delivery, bleaching) and help assess how susceptible the reef ecosystem may be to changes to physical forcing resulting from climate change.

**DP0984659** A/Prof KT Judd; Dr L Smith

**Approved Project Title** **Synthesis of dynamics, stochastics and information in forecasting and management of complex systems**

**2009 :** \$ 105,000  
**2010 :** \$ 87,000  
**2011 :** \$ 87,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Organisation** The University of Western Australia

### Project Summary

Research into complex systems is predicted to be the focus of twenty-first century science, since most of the problems of simple systems are solved. Examples include the weather and climate, economies, agriculture, ecologies, the mind and brain, genetics, biochemistry. Confidence in the reliability and usefulness of models will have significant bearing on how these models are used by decision making and how the community perceives the value of this science. Specific immediate benefits of the project include better policy and management responses to climate change and severe weather events.

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

**DP0985685** Prof JT Lambers; Dr EJ Veneklaas; Dr KW Dixon

**Approved Project Title** **Does plant phosphorus economy determine ecological status in biodiverse Australian communities?**

**2009 :** \$ 115,000

**2010 :** \$ 100,000

**2011 :** \$ 100,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Organisation** The University of Western Australia

### Project Summary

The phosphorus (P)-impoverished nature of the soils of south-western Australia has allowed the evolution of many plant species that are amazingly efficient at acquiring and utilising P. Among the most P efficient are species of the Proteaceae, which produce cluster roots. We will explore why less efficient species can co-occur with the very efficient Proteaceae. A deep and thorough understanding of the mechanism determining P efficiency of these species will contribute significantly to our basic understanding of P nutrition in plants and to our understanding of the P-impoverished ecosystems of the southwest. It will also assist in developing crops that are more efficient at acquiring and/or utilising P.

**DP0985873** Prof AH Millar; Dr NL Taylor; Dr N O'Toole; Prof P Gardstrom

**Approved Project Title** **Spatio-temporal analysis of molecular changes during leaf senescence in arabidopsis and wheat and their response to the environment**

**2009 :** \$ 124,000

**2010 :** \$ 100,000

**2011 :** \$ 103,000

**Primary RFCD** 2704 BOTANY

**Administering Organisation** The University of Western Australia

### Project Summary

Innovative agricultural solutions in Australia can be gained by changing the abundance of proteins and metabolites to influence plant performance and provide more robust plants and plant products. The aging and dying of leaves (leaf senescence) is a key factor in our understanding of plant development and the recovery of nutrients from dying tissues. Leaf senescence is also important for pre-harvest impacts on seed and grain quality as leaves represent the major nitrogen store remobilised to feed these plant products. This work will support the generation of intellectual property to be applied within Australia's plant-based industries and at the same time provides a strong environment for the training of students and researchers.

**DP0985832** Dr DV Murphy; Prof RJ Gilkes; Prof AG O'Donnell; Dr E Brodie

**Approved Project Title** **The connectivity of pore theory - does it influence microbial community composition and function?**

**2009 :** \$ 140,000

**2010 :** \$ 110,000

**2011 :** \$ 110,000

**Primary RFCD** 3001 SOIL AND WATER SCIENCES

**Administering Organisation** The University of Western Australia

### Project Summary

Climate change scenarios indicate that Australia will be directly affected by an increase in greenhouse gas emissions. Soil microbial activity is responsible for a large proportion of such emissions; therefore it is important that we understand how such changing climate patterns are likely to influence key microbial populations in soil, particularly those involved in the production of greenhouse gases. This research interfaces two disciplines, earth and biological sciences, and will establish a new international collaboration that will ensure Australia is at the forefront of a rapidly developing research field.

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

**DP0988241** A/Prof BD Nener; Dr G Parish; Dr M Kocan; Dr KD Pflieger; Prof UK Mishra  
**Approved Project Title** **Advanced microelectronic transistor structures for novel biosensor technology**  
**2009 :** \$ 140,000  
**2010 :** \$ 85,000  
**2011 :** \$ 85,000  
**Primary RFCD** 2909 ELECTRICAL AND ELECTRONIC ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

This international, interdisciplinary team aims to develop an electronic biosensor technology that will significantly advance biomedical research to combat human disease. This is likely to have a major social impact on the community, improve health outcomes and generate substantial economic potential for the pharmaceutical industry. The principal benefit of this research will be the fabrication of electronic devices based on advanced materials, significantly reducing the time, the biological material used and the complexity of assessing human cell function. In addition to improving health through novel biosensor techniques, this technology is expected to lead to the creation of commercially important intellectual property.

**DP0984683** A/Prof LM Parker; Dr C Hoon; Dr R Raihani  
**Approved Project Title** **Education for a Tolerant and Multicultural Indonesia**  
**2009 :** \$ 190,000  
**2010 :** \$ 120,000  
**2011 :** \$ 135,000  
**Primary RFCD** 4203 CULTURAL STUDIES  
APD Dr R Raihani  
**Administering Organisation** The University of Western Australia

### Project Summary

The recent shift towards fundamentalist Islam and upsurge in religious and ethnic conflict in Indonesia are matters of great concern for Australia. This project will investigate how education can facilitate peaceful multiculturalism in Indonesia and explore the potential for the co-existence of Islamic and secular educational systems. This research will improve Australia's capacity to understand our region's 'languages, societies, politics and cultures' (National Research Priority 4). Australia has been a world leader in expertise on Indonesia; we need projects like this to train junior scholars and thus sustain Australia's international reputation for excellence in Indonesian Studies into the future.

**DP0988193** Prof Z Rengel; Prof K Siddique; Dr AJ Diggle; Prof J Lynch  
**Approved Project Title** **Using modelling to optimise the structure and function of crop root systems for dryland agriculture**  
**2009 :** \$ 190,000  
**2010 :** \$ 120,000  
**2011 :** \$ 110,000  
**Primary RFCD** 3001 SOIL AND WATER SCIENCES  
**Administering Organisation** The University of Western Australia

### Project Summary

The crop root systems are poorly suited to harsh conditions in Australian agriculture, especially as climate is getting drier. Poor water-use efficiency lowers crop yields below the potential yield; moreover, unutilised water and nutrients contribute to environmental problems, eg salinity and eutrophication. This project will use our simulation model to develop computer-aided design of 3-D root structure and function (water and nutrient uptake) tailored to particular environments. Modelling will also link suitable root traits to genetic markers in well-characterised lupin germplasm. The blueprint developed here will be adaptable to other crops. The project will enhance breeding for increased water- and nutrient-use efficiency.

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

**DP0986067** Dr TB Sercombe  
**Approved Project Title** **Direct Laser Sintering of Aluminium**  
**2009 :** \$ 140,000  
**2010 :** \$ 90,000  
**2011 :** \$ 90,000  
**Primary RFCD** 2914 MATERIALS ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

The project has both national and international significance and addresses the National Research Priority: Frontier Technologies - Advanced Materials (light alloys). Rapid manufacturing produces functional parts directly from a computer solid model using a layer wise rapid prototyping device. Rapid manufacturing is particularly important in the Australian context where small production runs means that tooling and inventory costs are a much larger proportion of the total cost than in North American, European or Asian countries. With a large installed machine base, a substantial automotive and automotive component industry and a major aluminium industry, this project can assist in the further development of these industries.

**DP0986315** Prof MA Spackman  
**Approved Project Title** **Voids in molecular crystals: Novel computational approaches to their characterization, physicochemical nature, and influence on bulk properties**  
**2009 :** \$ 120,000  
**2010 :** \$ 90,000  
**2011 :** \$ 90,000  
**Primary RFCD** 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY  
**Administering Organisation** The University of Western Australia

### Project Summary

Key to the research objectives is further development of our own innovative software and techniques, now used by hundreds of researchers worldwide for the visualization and exploration of the structure and properties of molecular crystals. Through involvement of postdoctoral fellows and PhD students in an international collaborative research program involving a synergy between software development and visualization, and sophisticated modelling of the detailed nature of molecular crystals, the project contributes directly to producing researchers familiar with state-of-the-art theoretical and computational techniques, and well equipped to match the needs of one of the nation's articulated research priorities.

**DP0985848** A/Prof TG St Pierre; Prof JS Riffle  
**Approved Project Title** **Measurement and imaging of pathogenic and diagnostic iron oxide nanoparticles using proton magnetic resonance**  
**2009 :** \$ 120,000  
**2010 :** \$ 120,000  
**2011 :** \$ 120,000  
**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

This project is likely to result in new and improved technologies to aid in the management and diagnosis of a range of diseases including iron metabolism disorders such as thalassaemia and neurodegenerative diseases such as Alzheimer's disease. Other aspects of the research may lead to technologies for the early detection of some cancers. The technologies will enhance Australia's international standing in the field of advanced medical imaging and have the potential to be commercialised within the Australian biotechnology sector. During the project, research students will receive high quality multidisciplinary training ensuring the supply of personnel with high-level technical expertise into the future.

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

**DP0988962** Prof RL Stamps; Dr J Ferre; Dr P Politi; Dr F Klose

**Approved Project Title** **Memory effects in magnetic metals: origin, utility and control in magnetoelectronics using layered nanopatterns**

**2009 :** \$ 192,000  
**2010 :** \$ 117,000  
**2011 :** \$ 127,000  
**2012 :** \$ 222,000  
**2013 :** \$ 222,000

**Primary RFCD** 2914 MATERIALS ENGINEERING  
 APF Prof RL Stamps  
**Administering Organisation** The University of Western Australia

### Project Summary

The work is in the important area of magneto-electronics, a field recognised by the 2007 Nobel Prize awarded in Physics. Training opportunities for Honours and postgraduate students will be provided at the forefront of this high profile area, thereby expanding Australian knowledge base and capability. New opportunities for interaction between several groups in Australia will be created. The projects will involve PhD students shared between Australian institutions and collaborating groups overseas, thereby cementing collaborations while simultaneously providing unique training environments. The project will use and support activities associated with the Australian major facilities.

**DP0988351** Dr KL Swaminatha-lyer; Prof SA Dunlop; Dr G Plant; Prof AR Harvey

**Approved Project Title** **Using magnetic nanotechnology to aid recovery from neurotrauma**

**2009 :** \$ 150,000  
**2010 :** \$ 110,000  
**2011 :** \$ 110,000  
**2012 :** \$ 110,000  
**2013 :** \$ 110,000

**Primary RFCD** 2705 ZOOLOGY  
 ARF Dr KL Swaminatha-lyer  
**Administering Organisation** The University of Western Australia

### Project Summary

Nanotechnology is an exciting new field that holds great promise to solve challenging health issues including neurotrauma associated with brain and spinal cord injury. Current methods to deliver drugs and stimulate tissue repair after neurotrauma do not work effectively and new approaches are urgently need. The recently established research team brings together expertise in nanotechnology and neuroscience to develop new, safe ways to deliver drugs and stimulate tissue repair after neurotrauma, and provide quality research training. Specifically designed nanomaterials will deliver drugs slowly over time and act as scaffolds to stop cells dying and stimulate them to restore broken connections and work again.

**DP0988477** Dr BE Treeby; Prof Dr J Pan; Prof D McAlpine

**Approved Project Title** **Modelling the acoustical scattering properties of the human auditory system**

**2009 :** \$ 95,000  
**2010 :** \$ 90,000  
**2011 :** \$ 90,000

**Primary RFCD** 2405 CLASSICAL PHYSICS  
 APD Dr BE Treeby  
**Administering Organisation** The University of Western Australia

### Project Summary

The audio and entertainment industry is continually striving towards the development of immersive consumer technologies. Australian companies and researchers within this market sector utilise these audio technologies for many innovative applications, including virtual reality, communication, navigation, monitoring, and auditory products for the hearing impaired. These developments rely heavily on a fundamental understanding of our natural sense of spatial hearing. This project will extend the current understanding of the acoustic scattering mechanisms that govern the external auditory system, and provide critical enabling knowledge that will enhance the development of innovative audio technologies.

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

**DP0989007** Mr B Vo  
**Approved Project Title** **Efficient Algorithms for Multiple Object Filtering using Stochastic Geometry**  
**2009 :** \$ 90,000  
**2010 :** \$ 80,000  
**2011 :** \$ 80,000  
**Primary RFCD** 2301 MATHEMATICS  
APD Mr B Vo  
**Administering Organisation** The University of Western Australia

### Project Summary

The outcomes of this project will enhance our ability to harness advances in sensing and computing technologies and develop automated systems which facilitate rapid and reliable detection and monitoring of potential threats in our air, sea, and land space. Such systems assist our defence personnel in the event of a threat to implement measured and effective responses, and ultimately enhance Australia's operational advantage, in line with the national research priority of 'Safeguarding Australia' and its associated priority goals. The developed technologies also have significant commercial potential which benefit Australian industries in areas such as robotics, automotive safety and biomedical engineering.

**DP0986245** Prof JM Whelan  
**Approved Project Title** **The regulation and role of dual targeted proteins in plant cells**  
**2009 :** \$ 100,000  
**2010 :** \$ 100,000  
**2011 :** \$ 100,000  
**Primary RFCD** 3002 CROP AND PASTURE PRODUCTION  
**Administering Organisation** The University of Western Australia

### Project Summary

Plant cells are the factories that provide the food we eat, the air we breath, play a critical role in a balanced environment and provide energy in a sustainable manner. The varied use of plants and plant products is underpinned by an understanding of biochemistry that takes place in plant cells. This proposal is aimed at understanding how some proteins function in more than one location in the multi-compartmentalised plant cell biochemical factory. The knowledge that is generated from this research can be used to underpin innovative use of plants within Australia's plant based industries. Furthermore it provides a rich intellectual training environment for students and postdoctoral researchers.

**DP0988368** Dr B White; Prof DJ Pannell; Dr G Doole  
**Approved Project Title** **Presumed Guilty: An Economics Analysis of the Efficiency of Environmental Bonds for the WA Mining Sector.**  
**2009 :** \$ 80,000  
**2010 :** \$ 50,000  
**Primary RFCD** 3402 APPLIED ECONOMICS  
**Administering Organisation** The University of Western Australia

### Project Summary

Environmental bonds have two important economic effects. First they give an incentive for mining firms to manage environmental damage and second they prevent excessive costs falling on the regulator in the case of bankruptcy. The aim of this project is to assess if this policy can be redesigned to increase its economic efficiency.

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

**DP0988920** Prof JF Williams; Dr S Samarin; Dr A Suvorova; Prof Dr J Berakdar

**Approved Project Title** **Spin dynamics in magnetic nanostructures by spin-polarized single- and two-electron spectroscopy**

**2009 :** \$ 100,000  
**2010 :** \$ 100,000  
**2011 :** \$ 100,000

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

**Administering Organisation** The University of Western Australia

### Project Summary

The technological and fundamental outcomes will underpin development of spin-polarized electron dynamics in magnetic nanostructures. Electron spin dynamics offers active control and manipulation of electron spin in ultrathin films as the basis of novel technology. Potential applications are high-speed filters, sensors, quantum transistors. The surface science-based industry will find applications for manufacturing and control in nanotechnology. This project contributes to postgraduate and postdoctoral research and training to encourage excellence, with depth of knowledge in interdisciplinary research, a scientific environment providing access to research not otherwise in Australia, and experience in construction of scientific instruments.

**DP0988036** Prof D Zhang; A/Prof H Zhang

**Approved Project Title** **Ignition Mechanisms and Flame Evolution of Single Particles and Clouds of Pulverised Coal under Microgravity Condition**

**2009 :** \$ 120,000  
**2010 :** \$ 120,000  
**2011 :** \$ 120,000

**Primary RFCD** 2999 OTHER ENGINEERING AND TECHNOLOGY

**Administering Organisation** The University of Western Australia

### Project Summary

Gravity obscures some of the most subtle phenomena that are key to answering outstanding questions today, including combustion phenomena. The main scientific benefit from this fundamental research stems from the fact that it addresses far-reaching issues that transcend the boundaries of combustion science. It provides a rare opportunity to observe and understand the fundamental phenomena of combustion beyond the limitation of gravity on the earth surface, thus enriching our body of knowledge in this area. This new knowledge will provide a foundation for tomorrow's combustion science and technology.