

# Summary of Discovery Projects Applications for Funding to Commence in 2006

## Western Australia

### The University of Western Australia

**DP0665616** A/Prof M Anderson; Dr AM Fox; Ms CL Reid; Prof DV Bishop

**Approved Project Title** **Maturation of the brain and the development of cognitive abilities**

**2006 :** \$140,000

**2007 :** \$100,000

**2008 :** \$120,000

**2009 :** \$120,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Institution** The University of Western Australia

#### Project Summary

This project aims to develop techniques for measuring the growing brain. We will use these techniques to determine how the growing brain influences a child's intellectual ability and to answer an important question - do areas of the brain mature at the same or different rates and what influence does that have on the development of specific abilities such as language and reasoning? An answer to this question will make an important contribution to our theoretical understanding of developmental disorders. Moreover, given the influence of intellectual development on life prospects, it is important to understand how early brain development impacts on a child's ability to learn.

**DP0662985** Dr CA Arrese; Prof LD Beazley; Prof DM Hunt

**Approved Project Title** **Evolution and function of colour vision in mammals**

**2006 :** \$70,000

**2007 :** \$70,000

**2008 :** \$70,000

**Primary RFCD** 3207 NEUROSCIENCES

**Administering Institution** The University of Western Australia

#### Project Summary

The project aims to investigate colour vision in marsupials and monotremes (echidna and platypus) with differing phylogenies and biogeographic histories. Improving knowledge of the molecular structure of opsin genes mediating colour vision will be crucial to the understanding of evolution and function of this key mammalian (including human) sensory capacity. Understanding species colour discrimination will contribute to protective measures of Australia's unique fauna, presenting social and economic assets for the local and national community, and will set a standard that should be applied world-wide. Close international links and intellectual exchange will be invaluable to the Australian science community, including students.

**DP0666206** Prof DR Badcock

**Approved Project Title** **Characterising and linking intermediate-level processing of pattern, motion and position in human vision?**

**2006 :** \$65,000

**2007 :** \$50,000

**2008 :** \$55,000

**2009 :** \$65,000

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Institution** The University of Western Australia

#### Project Summary

This work will advance basic science by enhancing understanding of human coding of image structure. The aim is to provide a common structure for understanding visual processing of form, motion and position. The work will help lift the international profile of Australian science. Explaining how the primitives for shape perception are extracted will also have consequences of potential economic benefit. One important aspect is the design of displays that allow observers to absorb complex information about rapidly changing situations. This work has the potential to provide information that enables display designers to optimise the efficiency of presentation of pattern and motion information.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0663037** A/Prof MV Baker; A/Prof TV Chirila; Prof AK Whittaker; A/Prof H Kraatz

**Approved Project Title** **Biodegradable Porous HEMA-Based Polymers: Innovative Strategies for the Design and Tuneable Single-Step Production of a Novel Class of Scaffolds for Tissue Engineering**

**2006 :** \$220,000

**2007 :** \$160,000

**2008 :** \$160,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

This project will lead to the development of new biocompatible, biodegradable, porous materials ideally suited to many applications in tissue engineering. These new biomaterials will be relatively inexpensive to manufacture, via simple processes using non-toxic reagents. The key properties of the biomaterials will be controllable by appropriate choice of starting materials. The availability of these new biomaterials will facilitate future developments in tissue engineering, which will ultimately lead to improved medical outcomes in areas as diverse as joint and bone repair and organ regeneration. Local manufacture of these biomaterials would also contribute to the development of the Australian biotechnology industry.

**DP0664228** A/Prof M Bennamoun; Prof RA Owens

**Approved Project Title** **Unified Representations of Multimodal Biometrics for Robust Authentication and Identification**

**2006 :** \$132,000

**2007 :** \$113,000

**2008 :** \$111,000

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

**Administering Institution** The University of Western Australia

### Project Summary

We propose two biometric systems based on two novel unified multimodal biometric representations. These systems will have a great potential impact on the national economy by reducing frauds related to identity, credit card transactions, and ATM withdrawals. Statistics show that these types of frauds are dramatically increasing in the U.S.A., the U.K., and Australia. Our systems will also have government applications and will impact on the national security in areas related to immigration, passport and driver's license controls. Forensic applications include criminal identification, crime scene investigation and corpse identification (as in the case of the victims of the Asian tsunami 2004).

**DP0662817** Prof SJ Berners-Price; Prof NP Farrell; Mr DS Thomas

**Approved Project Title** **Second Generation Polynuclear Platinum Compounds. Mechanistic NMR Studies Probing DNA Binding and Pharmacokinetics**

**2006 :** \$90,000

**2007 :** \$90,000

**2008 :** \$90,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Institution** The University of Western Australia

### Project Summary

Cancer affects one in four Australians and 50% of cancer patients are treated with cisplatin. BBR3464 is a new type of platinum anticancer drug that has shown promise in clinical trials, including results in cancers that do not respond to cisplatin treatment. Second-generation analogues, now under development, may offer significant advantages. This international collaboration between Prof. Berners-Price and the inventor of these new drugs puts Australian research at the forefront of the clinical development. There is the potential for the generation of new IP from new strategies in the design of improved anticancer drugs. The project builds strong international links and provides international training for Australian PhD students.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0664909** Dr F Boussaid; Prof RR Etienne-Cummings

**Approved Project Title** **Biomimetic Ultra-Thin Compound-Eye Vision Sensor**

**2006 :** \$60,000

**2007 :** \$56,000

**2008 :** \$46,000

**Primary RFCD** 2909 ELECTRICAL AND ELECTRONIC ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

With the recent advances in microelectronic fabrication technology, it becomes possible today to fabricate paper-thin imaging systems. The proposed research will target the development of such systems to enable the concept of 'stick-on cameras'. Examples of potential applications for this new imaging technology include head-mounted camera patches for rescue workers, smart credit card capable of identifying its user by fingerprint technology, discrete monitoring of venues, preventing driver's drowsiness inside a car but also assisting in medical diagnosis and minimally invasive surgery. This leading edge research will enhance the reputation of Australia as a leader in frontier technologies.

**DP0664001** Prof AA Brennan; Prof JE Malpas

**Approved Project Title** **Making Ethics Work: A New Model for Business and Professional Ethics**

**2006 :** \$79,142

**2007 :** \$132,116

**2008 :** \$110,916

**Primary RFCD** 4401 PHILOSOPHY

**Administering Institution** The University of Western Australia

### Project Summary

Sound ethical practice is fundamental to long-term business success and organizational well-being. In developing a new framework for applied ethics, this project will enhance understanding of the foundations of ethics in business, organizational and professional contexts, as well as enabling improved ethical practice in those domains. As such, it will assist in strengthening Australia's social and cultural fabric, in promoting the conditions that facilitate innovation and creativity, in developing leadership capacities and organisational structures, and in supporting Australian business and industry through promoting greater ethical awareness and expertise.

**DP0664008** Dr SM Broomhall

**Approved Project Title** **Voicing the Welfare State: Experiences of the Sixteenth-Century French Poor**

**2006 :** \$74,595

**2007 :** \$75,000

**2008 :** \$79,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Institution** The University of Western Australia

### Project Summary

This research enhances our historical understanding of poverty and its support mechanisms in Europe's past, through reconstruction of a comprehensive and detailed picture of the sixteenth-century French poor. New methodologies and techniques for recovery of formal and informal social networks will be developed. Historical models of such mechanisms provide context of the long history of Australia's welfare structure models, philosophy and participation strategies. The programme provides expert research training for early career researchers, in a collaborative Humanities team environment. Australian historians can thus continue to generate globally competitive and significant research.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0665327** Prof MB Bush; A/Prof X Hu; Dr BR Lawn

**Approved Project Title** **Failure of Complex Biomechanical Structures**

**2006 :** \$140,000  
**2007 :** \$115,000  
**2008 :** \$115,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Institution** 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 dental crown structures. We are now at a critical point in the understanding of how these structures fail, and are beginning to make substantive predictions to improve designs for prolonged life. The project is connected to the dental community and international crown material manufacturers through a broader NIH project in the USA. The improved materials and crown designs resulting from this project will have impact worldwide, including Australia.

**DP0663247** Dr KW Carter; Prof LJ Palmer; Prof JL Hopper; Dr ML Hazelton; Prof AJ Baddeley

**Approved Project Title** **Novel Bioinformatics approaches for genetics and data linkage**

**2006 :** \$85,000  
**2007 :** \$74,340  
**2008 :** \$74,340

**Primary RFCD** 2801 INFORMATION SYSTEMS

APD Dr KW Carter

**Administering Institution** The University of Western Australia

### Project Summary

The research project will involve creation of novel data and communications formats to fulfil the vital task of integrating the vast heterogeneous biological resources available. We will apply this new infrastructure to a large data linkage project. In parallel, we will undertake methodological research in informatics to design high throughput research methods and tools to analyse and visualise genetic data. These will be applied to linkage disequilibrium mapping and haplotyping in human, animal and plant diseases. Improving informatics integration and designing novel methods and implementations of algorithms will be beneficial to local and international researchers in a range of fields.

**DP0663574** Dr JP Evans

**Approved Project Title** **Postcopulatory sexual selection and intraspecific variation in sperm competition traits**

**2006 :** \$185,000  
**2007 :** \$152,000  
**2008 :** \$152,000  
**2009 :** \$152,000  
**2010 :** \$152,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

QEII Dr JP Evans

**Administering Institution** The University of Western Australia

### Project Summary

This project will contribute towards Australia's burgeoning reputation as a country where excellent and original research in behavioural ecology and evolution is conducted. By focusing on the evolution and function of sperm and genitalic traits, the project will address fundamental questions at the core of contemporary evolutionary research, thereby yielding results that will have a significant international impact. Australian science will further benefit from the research fellow's established collaborations with international scientists and through the training of young scientists.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0665763** Dr PM Finnegan

**Approved Project Title** **Arabidopsis DNA binding proteins that control transcription of its mitochondrial genome**

**2006 :** \$95,000

**2007 :** \$85,000

**2008 :** \$85,000

**Primary RFCD** 3002 CROP AND PASTURE PRODUCTION

**Administering Institution** The University of Western Australia

### Project Summary

The increases in crop output and quality needed to drive the agricultural sector of Australia's future economy will arise from knowledge gained by combining traditional methods and the type of cutting-edge research that identifies plant mitochondrial DNA-binding proteins and their sites of action. Mitochondria are fundamental to many agronomically important traits, including plant growth, fruit ripening and plant stress and disease defence. Opportunities for the rational manipulation of these and hitherto undiscovered traits will come from new knowledge generated by this project, which will develop and use frontier technologies that will keep Australia at the forefront of international research into mitochondrial structure and function.

**DP0664751** Dr A Ghadouani; Prof GN Ivey; Prof WD Taylor; Prof B Pinel-Alloul

**Approved Project Title** **Predicting plankton patchiness in lakes using a high resolution sampling system**

**2006 :** \$60,000

**2007 :** \$40,000

**2008 :** \$40,000

**Primary RFCD** 2911 ENVIRONMENTAL ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

This research will benefit Australian Society through a better understanding and prediction of the response of aquatic systems to major shifts in the environment. Eutrophication and toxic algal blooms represent serious threats to the security of water supplies in Australia and elsewhere. Through development of high resolution technology (SPS), this project will provide the necessary knowledge and data for producing management tools capable of detailed predictions of the behaviour of aquatic systems. Successful management of Australian waters relies heavily on a better understanding of the scale dependent processes which govern the response to external perturbations such as increased nutrient export and consequent eutrophication.

**DP0663339** Prof MD Grounds; Prof UM Wewer

**Approved Project Title** **The molecular role of ADAM12 in maintenance of skeletal muscle, myogenesis and adipogenesis**

**2006 :** \$110,000

**2007 :** \$83,000

**2008 :** \$83,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Institution** The University of Western Australia

### Project Summary

An understanding of the molecular control of skeletal muscle growth, maintenance and balance between muscle and fat production is of fundamental importance for a competitive meat industry, for the promotion of strong muscles in the ageing population and for disorders such as muscle diseases, diabetes and obesity. This project will enhance strong international collaborations and expand cutting-edge research within Australia with many potential economic benefits for the meat industry, biotechnology and health. The expertise developed by this pioneering research will ensure that Australia is well placed to harness new technologies and exploit future advances in this fast-moving field of muscle biology.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0663491** Prof SJ Houghton; Dr A Carroll; Dr SL Hopkins

**Approved Project Title** **Trajectories of Childhood Antisocial Behaviour: A New Model and Prevention Program for the Early Onset Life Course Persistent Offender**

**2006 :** \$55,000

**2007 :** \$55,000

**2008 :** \$55,000

**2009 :** \$55,000

**Primary RFCD** 3301 EDUCATION STUDIES

**Administering Institution** The University of Western Australia

### Project Summary

Criminal offences committed by children under 14 years in Western Australia and Queensland increased by almost 20% in 2003. Many individuals involved in these actions began their antisociality in primary school and continued through high school, despite intervention. Support for the developmental pathway to early onset persistent offending is found in the school suspension and exclusion data where in 2002, 3339 Western Australian primary school children were suspended. Trends are comparable in Queensland. Antisocial behaviour is a major costly education and public health problem. This research addresses the issue of preventative treatments and hence State and Federal government expenditure.

**DP0666102** Prof J Imberger; Prof G D'Antona

**Approved Project Title** **The application of inverse methods for resolving velocity, density and mixing fields in lakes and estuaries.**

**2006 :** \$86,544

**2007 :** \$78,721

**Primary RFCD** 2911 ENVIRONMENTAL ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

The two techniques to be developed and tested here will allow the measurement of the 3D density and velocity fields in lakes and estuaries using only simple instruments and with minimum lake obstruction. Coupled with a Real Time Management System, these techniques can be used to validate numerical models and to simulate scenarios, such as future flood events, which have the potential for contamination of water quality. The output from these simulations is then used, again in real time, to evaluate the new Index of Sustainable Functionality of the water body. When augmented with the results from this research we would have a tool that would help manage lakes and reservoirs to optimize the water quality, while maintaining the supply.

**DP0663334** Prof GN Ivey; Prof CB Pattiaratchi

**Approved Project Title** **Tidal generation of internal waves and currents**

**2006 :** \$160,000

**2007 :** \$80,000

**2008 :** \$115,000

**Primary RFCD** 2604 OCEANOGRAPHY

**Administering Institution** The University of Western Australia

### Project Summary

The North West Shelf (NWS) is a region of great significance to Australia, due mainly to the presence of the multi-billion dollar oil and gas industry, but also for fishing and national defense issues. This project will combine laboratory, numerical and field studies to quantify the production of internal waves on the NWS. The results will aid engineering design of offshore pipeline and structures, for both current production facilities and for future developments in deeper waters. The project will also provide quantitative knowledge and predictive behavior of the marine environment, allowing the development of earth and marine resources in a sustainable and informed way to protect the marine-based biodiversity.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0662841** A/Prof KT Judd; Dr L Smith

**Approved Project Title** **Forecasting and management using imperfect models, with a focus on weather and climate**

**2006 :** \$83,000

**2007 :** \$73,000

**2008 :** \$75,000

**Primary RFCD** 2301 MATHEMATICS

**Administering Institution** 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.

**DP0664698** A/Prof SM Kuzenko; Dr IN McArthur; Prof SJ Gates

**Approved Project Title** **Progress in Supersymmetry and Supergravity: Continuing Einstein's Legacy**

**2006 :** \$240,000

**2007 :** \$180,000

**2008 :** \$180,000

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

**Administering Institution** The University of Western Australia

### Project Summary

2005 is the International Year of Physics in recognition of Einstein's revolutionary contributions. His unfinished quest for a unified description of Nature has become the hottest topic in modern physics. Led by a team of internationally recognized experts, this project will yield breakthroughs in supersymmetry and supergravity - crucial ingredients of current approaches to unification. As well as putting Australia at the forefront of this mainstream activity, a fertile environment will be provided for the training of graduate students. They will be ideally placed to lead Australia's involvement in the revolution sparked by the expected experimental confirmation of supersymmetry with the next generation of particle accelerators.

**DP0667326** Prof P LeSouef; Prof AH Bittles; Dr J Goldblatt; Mr P Candelaria

**Approved Project Title** **Evolution and the immune system: genetic differences in immune response between human populations due to adaptation to living in different geo-climatic locations**

**2006 :** \$120,000

**2007 :** \$95,000

**2008 :** \$95,000

**Primary RFCD** 2702 GENETICS

**Administering Institution** The University of Western Australia

### Project Summary

The project, which investigates the genetics of inter-population differences in immune response, will lead to advances in immunology and population genetics research, explain present population specific differences in disease incidence and possibly forecast future population trends of diseases such as asthma and allergy. The study will strengthen ties with collaborators around the world, thus promoting excellence in Australian research and gain Australia prestige in the international community as a country that produces research of global significance. Understanding the immune system's 'recent evolutionary roots' has implications for the health of Australians, especially in light of Australia's increasingly multi-ethnic background.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0662831** A/Prof AN Luiten; A/Prof EN Ivanov; Dr JJ McFerran; Dr CR Locke; Prof A Clairon; Dr FA Benabid

**Approved Project Title** **Developing New Clocks for Australia: Testing the Assumptions of Modern Physics**

**2006 :** \$270,000

**2007 :** \$180,000

**2008 :** \$180,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

APD Dr CR Locke

**Administering Institution** The University of Western Australia

### Project Summary

Clocks lie at the heart of all precise measurement devices; for example, they are the crucial elements in modern navigation and telecommunications systems. This project will develop three new clocks for Australia: a laser clock at the leading edge of technology, a novel and compact clock with commercial potential, and a microwave clock for use in the next generation of satellites. The performance advantage conferred by our new devices can deliver economic benefits while also giving the possibility for scrutinizing the laws of physics for evidence that there is something beyond our present formulation.

**DP0666652** Dr D McDougall

**Approved Project Title** **Christianity, conflict, and culture: an anthropological investigation of the political role of churches in Solomon Islands**

**2006 :** \$85,000

**2007 :** \$66,000

**2008 :** \$70,000

**2009 :** \$60,000

**Primary RFCD** 3703 ANTHROPOLOGY

APD Dr D McDougall

**Administering Institution** The University of Western Australia

### Project Summary

This project contributes to a better understanding of one of Australia's closest neighbours, Solomon Islands. This nation, the site of political turmoil in recent years, is now the focus of an Australian-led Regional Assistance Mission. Many scholars and policy makers have commented on the importance of Christian organizations during the crisis in Solomon Islands and the need to incorporate them in current attempts to restore stability and prosperity. However, most discussions are not informed by an understanding indigenous Christian belief and practice, a lacuna that this project aims to fill by providing an ethnographic investigation of how church-linked groups engage with secular national and international organizations.

**DP0664534** A/Prof K Miller; Prof N Knuckey; A/Prof SK Warfield; Dr K Chinzei

**Approved Project Title** **Biomechanical model-based algorithms for computational radiology of the brain**

**2006 :** \$100,000

**2007 :** \$70,000

**2008 :** \$70,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

The proposed research will develop computational framework, which will allow matching high quality pre-operative brain images with lower resolution images taken during neurosurgery. The success of this work will greatly improve effectiveness of brain tumour removal, and therefore improve clinical outcomes. The proposed work will provide enabling technology for other areas of computer aided medicine, such as virtual reality operation planning systems with realistic force and tactile feedback, control systems of neurosurgical robots with tissue deformation prediction module, etc.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0663124** Dr LM Nimmo; Prof JS Nairne; Dr E Service

**Approved Project Title** **The role of retrieval cues when remembering over the short term**

**2006 :** \$90,000

**2007 :** \$90,000

**2008 :** \$90,000

**Primary RFCD** 3801 PSYCHOLOGY

APD Dr LM Nimmo

**Administering Institution** The University of Western Australia

### Project Summary

This project has two principal benefits: A basic scientific outcome concerning the development of a cue-driven memory model and an applied outcome that can inform the design of language learning tools. A core assumption proposed to explain short-term memory performance is that an event's salience affects its memorability. To date however, this salience dimension has escaped experimental vigour. This project examines the conditions under which some events are perceived to be more salient than others. In addition, by determining when, and which cues are more salient, the project can inform future design of language learning tools (e.g., interactive memory games).

**DP0663600** Dr LM Parker; Dr LR Bennett; Dr P Nilan; Dr KM Robinson

**Approved Project Title** **Ambivalent Adolescents in Indonesia**

**2006 :** \$135,000

**2007 :** \$170,000

**2008 :** \$80,000

**2009 :** \$25,000

**Primary RFCD** 4203 CULTURAL STUDIES

**Administering Institution** The University of Western Australia

### Project Summary

Indonesia's stability and prosperity are matters of great significance for Australia. Adolescents have spearheaded political and social transformations in Indonesia, but face continuing economic and social difficulties. Our project will provide Australia with knowledge about Indonesian youth culture, Islam among youth and adolescent reproductive health, enhancing understanding of social change in Indonesia and thereby contributing to Australian security in the region. Australia has been a world leader in expertise on Indonesia, but this expertise is dwindling. Our project puts together junior and established scholars, contributing to the sustainability of Australia's pre-eminent research position in Indonesian studies.

**DP0665454** Prof L Polizzotto

**Approved Project Title** **Family, Politics and Society: The Valori Household and Florence, 1380-1650**

**2006 :** \$40,000

**2007 :** \$35,000

**2008 :** \$33,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Institution** The University of Western Australia

### Project Summary

This is a study of one family's engagement in the turbulent and dangerous world of Florentine politics over nine generations. A study of the Valori will enable us to identify the political assumptions that inspired them and other Florentines to fight against the trends towards despotism. An understanding of these assumptions and the civic values they engendered will benefit our society's efforts to strengthen family bonds, instil civic responsibility and combat the political indifference which, in the opinion of our political leaders, threatens to 'disengage the young from the democratic process' (Governor-General Michael Jeffery, 26-1-2005).

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0664090** Prof SB Powles; Dr KJ Steadman; Dr H Hilhorst; Dr R Benech-Arnold; Dr PE Toorop

**Approved Project Title** **A novel role for phytochrome in dormancy release inhibition**

**2006 :** \$95,000

**2007 :** \$83,000

**2008 :** \$83,000

**Primary RFCD** 2704 BOTANY

**Administering Institution** The University of Western Australia

### Project Summary

Seed dormancy contributes to the persistence of weeds in agriculture by enabling seeds to remain viable in the soil for many years, and is a major reason why annual ryegrass (*Lolium rigidum*) has become the most economically damaging weed in Australian agriculture. Recently we discovered a new way to control dormancy release and germination in these seeds. This project to identify the changes occurring within the seeds during dormancy release will underpin our efforts to manipulate emergence timing in order to improve the efficacy of current weed control practices and contribute to sustainable farming systems.

**DP0665958** Prof MF Randolph

**Approved Project Title** **Application of field penetrometer data to offshore geotechnical design in deep water**

**2006 :** \$180,000

**2007 :** \$160,000

**2008 :** \$180,000

**2009 :** \$120,000

**2010 :** \$100,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Institution** The University of Western Australia

### Project Summary

Offshore oil and gas extraction is a \$17 billion/year industry and a major component of GDP, but facing increasing challenges in Australia as exploration extends into water depths exceeding 1 km. In order to develop safe and economic facilities in these environments, solutions to significant technical challenges are required, ranging from new technology to assess the strength of seabed soils, to formulating response models for oil and gas pipelines and shallow foundations or anchoring systems. This project contributes to future exploitation of offshore hydrocarbon reserves while minimising impact on the marine environment; it brings direct benefits to our economy and helps maintain our world leadership in offshore geotechnical research.

**DP0665388** Prof Z Rengel

**Approved Project Title** **Aluminium uptake across the root-cell plasma membrane**

**2006 :** \$80,000

**2007 :** \$75,000

**2008 :** \$75,000

**Primary RFCD** 3002 CROP AND PASTURE PRODUCTION

**Administering Institution** The University of Western Australia

### Project Summary

Aluminium toxicity limits crop growth in acid soils that occupy about 24 million hectares of agricultural land in Australia. Liming can increase pH of the surface soil, but is frequently too expensive in the low-input Australian agriculture. Surface-applied lime is poorly effective in ameliorating subsoil acidity, and incorporating lime deep into the profile is prohibitively expensive and technically difficult. Hence, Al-resistant crop cultivars are important part of sustainable farming in Australia. This project will characterise early triggers of Al toxicity in plants, providing a foundation for increasing Al resistance in crop cultivars. Understanding the physiological basis of Al toxicity will lead to improved crop breeding strategies.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0663243** Dr MW Shane

**Approved Project Title** **Australian rushes: unearthing the function of root clusters and sand-binding roots**

**2006 :** \$130,000

**2007 :** \$105,000

**2008 :** \$105,000

**Primary RFCD** 2704 BOTANY

APD Dr MW Shane

**Administering Institution** The University of Western Australia

### Project Summary

Unearthing the functioning of highly specialised root structures provides fundamental insights into the role of native rush plants in south-western Australian ecosystems and addresses a major issue with Australia's biodiversity, currently a Priority area for the ARC. Native rushes form a prominent but inconspicuous component of the Australian 'grass-like' flora, accounting for more than half the plant biomass on some landscapes. Rushes are also highly sensitive to small increments in nutrients in disturbed environments and thus form a management priority relating to their use in rehabilitation of degraded landscapes, such as mine sites and wetland margins.

**DP0665155** Dr PM Smith; Prof CA Atkins

**Approved Project Title** **Is transport of miRNAs essential for plant development?**

**2006 :** \$100,000

**2007 :** \$90,000

**2008 :** \$90,000

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

**Administering Institution** The University of Western Australia

### Project Summary

This project will provide knowledge of how a new class of biologically active molecule (micro RNA) regulates expression of genes at sites in the plant that are critical for growth and development. MicroRNAs are believed to influence the size and shape of plants, how rapidly they grow and how well they produce and fill seeds. These molecules are part of a group of bioactive signals that move throughout the plant, functioning like hormones but directly influencing how well critical genes work. Their exploitation holds great promise for manipulating plant performance and enhancing crop yields.

**DP0666434** Prof S Smith

**Approved Project Title** **Functional genomics approaches to the mechanisms of starch mobilisation in Arabidopsis**

**2006 :** \$350,000

**2007 :** \$285,000

**2008 :** \$285,000

**Primary RFCD** 2704 BOTANY

**Administering Institution** The University of Western Australia

### Project Summary

Starch is a key carbon and energy reserve that underpins plant growth. This in turn underpins much of Australia's \$60 billion agriculture industry. Starch also provides most of the calories in the human diet and is a renewable commodity supporting manufacturing industries. Dependence of society on starch will increase as it becomes used more for novel materials and for bio-ethanol production, which in turn will create new jobs in the rural economy. A major quality problem in cereal grain is pre-harvest starch breakdown caused by warm wet weather triggering events associated with germination. By understanding starch metabolism in plants we will be better able to manage and enhance growth of crop plants, starch production and seed quality.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0667197** Prof S Smith; Dr KW Dixon

**Approved Project Title** **Discovery of the physiological and molecular modes of action of butenolides in promoting seed germination and vigour in plants**

**2006 :** \$180,000

**2007 :** \$145,000

**2008 :** \$145,000

**Primary RFCD** 2704 BOTANY

**Administering Institution** The University of Western Australia

### Project Summary

The Australian discovery of butenolides opens up a new scientific frontier and new opportunities for land management, plant conservation and agriculture. Butenolides will be used to promote seed germination and plant growth in land reclamation, in conservation of species, to break dormancy in weeds so that they can be eradicated, and to promote germination and vigour in crops. Realising the full potential of butenolides demands that we understand how they work so that creative approaches can be developed that may not even require use of the chemical. Crucially by achieving these aims ahead of international competitors we can ensure that Australia gains maximum benefit.

**DP0666533** A/Prof RL Stamps; Dr A Mulders

**Approved Project Title** **Magnetic Nanostructures for Emerging Technologies: Experimental and Theoretical studies**

**2006 :** \$120,000

**2007 :** \$110,000

**2008 :** \$110,000

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

**Administering Institution** The University of Western Australia

### Project Summary

This project enables collaborations between Australian and European groups in an important and expanding area at the forefront of technology, and facilitates access to state of the art resources in laboratories in Austria and Spain. It carries across knowledge in synchrotron techniques just at the right time, just before the Australian synchrotron goes on line in 2008, allowing time to deepen expertise and to obtain specific knowledge. It will help establish a new effort at the University of Western Australia concentrated on developing advanced materials for technology. We will make important contributions to an internationally important area and offer high quality interdisciplinary research training in magnetic nanomaterials science.

**DP0663953** Dr KL Swaminatha-Iyer

**Approved Project Title** **Fabrication of robust nanoscale optical biosensors using the novel spinning disc reactor technology**

**2006 :** \$86,340

**2007 :** \$86,340

**2008 :** \$86,340

**Primary RFCD** 2914 MATERIALS ENGINEERING

APD Dr KL Swaminatha-Iyer

**Administering Institution** The University of Western Australia

### Project Summary

Spinning Disc Reactor (SDR) technology is new to Australia and will have wide ranging applications in nano-technology, and is destined to attract significant industrial interest beyond the proposed application in nano-scale biosensors. SDR is based on continuous flow and is more benign (less chemical waste) than traditional batch technology with a smaller footprint and significantly reduced capital outlay. The emergence of SDR technology will revolutionize the practice of nano-engineering leading to miniaturization of devices, advances in information technologies and intelligent systems, and the revolution in medical science. The exciting research will enhance public opinion towards science.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0663746** Dr JL Tomkins; Dr NR LeBas; Prof JS Kotiaho; A/Prof JW Radwan

**Approved Project Title** **Alternative reproductive tactics and threshold evolution**

**2006 :** \$85,000

**2007 :** \$50,000

**2008 :** \$50,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**Administering Institution** The University of Western Australia

### Project Summary

This research is focussed at the highest level in the field of evolutionary biology; testing recent theory for the evolution of alternative reproductive tactics and using these species to test hypotheses about adaptation. The proposal involves collaborations with high-profile researchers from three European countries and will increase Australia's standing as a world-leader in evolutionary biology. Australian students will benefit from exposure to high quality international collaborators. We will also increase our understanding of the biology of the European earwig, a pest species in Australia. Reproductive tactics are exciting topics for media attention and this research will reach a wide and interested Australian and world audience.

**DP0663543** Dr MA Tonts; Prof M Taylor; Prof RH Fagan; Dr P Plummer

**Approved Project Title** **New Regionalism and the Dynamics of Local Economies**

**2006 :** \$50,000

**2007 :** \$40,000

**Primary RFCD** 3704 HUMAN GEOGRAPHY

**Administering Institution** The University of Western Australia

### Project Summary

The economic development of Australia's regions is of ongoing concern and importance to governments, communities and businesses. This research will provide new insights into the factors underpinning local economic growth, and the extent to which these are supported or otherwise by emerging approaches in regional policy and practice. This is especially important given the need to ensure the effectiveness regional and local development strategies. By analysing the dynamics of local economies in their policy context, the research will offer development strategies that will underpin economically sustainable businesses, localities and regions. This has the potential to lead to more productive and prosperous regional and local economies.

**DP0663670** Dr AM Waite; Prof CM Duarte; Dr S Agusti; Dr J Montoya

**Approved Project Title** **Biological Oceanographic Mechanisms Driving Australia's Coastal Fisheries**

**2006 :** \$140,000

**2007 :** \$80,000

**2008 :** \$90,000

**Primary RFCD** 2604 OCEANOGRAPHY

**Administering Institution** The University of Western Australia

### Project Summary

Overfishing results in the irreparable destruction of fish stocks and biodiversity, nationally and globally. To manage marine resources effectively we must implement sustainable practices, including catch limits for low stock sizes. However a critical limiting factor in determining appropriate actions is our poor understanding of the mechanisms driving production. Our project will provide key information on the biological oceanographic mechanisms supporting Australia's coastal fisheries, linking nutrient supply, biological drivers and climate. By linking all these factors we will not only assist in determining appropriate ecosystem management but provide a knowledge base to support adaptation to future changes in Australia's climate.

## Summary of Discovery Projects Applications for Funding to Commence in 2006

**DP0664692** A/Prof JM Whelan; Dr AH Millar

**Approved Project Title** **Dual-targeting of proteins and its role in coordinating organelle functions in plants**

**2006 :** \$250,000

**2007 :** \$185,000

**2008 :** \$185,000

**Primary RFCD** 2704 BOTANY

**Administering Institution** The University of Western Australia

### Project Summary

Innovative agricultural solutions in Australia's future will be built on understanding and manipulating the expression of groups of genes to influence whole plant phenotypes providing more robust plants and high value plant products. Plant energy organelles are central components in plant metabolism, their coordination by processes such as dual-targeting has potential to modify germination characteristics, early seedling vigour, and stress tolerance. Studying energy organelles could generate valuable intellectual property to be applied within Australia's large plant-based industries and at the same time provide a rich intellectual environment for the training of research students and postdoctoral researchers.

**DP0666826** Prof JF Williams; Dr S Samarin; Prof J Kirschner; Dr J Berakdar; Prof Dr M Donath

**Approved Project Title** **Visualizing spin-related properties of functional nanostructures (for spintronics).**

**2006 :** \$130,000

**2007 :** \$120,000

**2008 :** \$110,000

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

**Administering Institution** The University of Western Australia

### Project Summary

This project contributes to undergraduate, postgraduate and postdoctoral research and training to encourage the pursuit of excellence, with:

- increased depth of knowledge in interdisciplinary research,
- a scientific environment providing access to research not otherwise in Australia,
- experience in the design, construction and development of scientific instruments.

Possible applications include high-speed magnetic filters, sensors, quantum transistors and spin qubits for quantum computers. The technological aspects of our project's outcomes offer real prospects of local development. The development of spin-polarized electron spectroscopy has great potential for existing applications in the surface science industry.