

**Western Australia**

**The University of Western Australia**

**DP1097003** Prof DR Badcock

**Approved Project Title** **Human visual determination of shape.**

**2010 :** \$ 106,943

**2011 :** \$ 115,751

**2012 :** \$ 115,714

**Primary RFCD** 3801 PSYCHOLOGY

**Administering Organisation** The University of Western Australia

**Project Summary**

Visual coding of shape is central to our ability to interact with objects effectively. The visual system contains processes that are specific to particular shapes and this work aims to determine how those processes are used by the system in visual analysis. The work will advance theoretical understanding, and will contribute to the training of the next generation of researchers but also has the potential to provide information that enables display designers to determine the most efficient way to detect and present pattern information. This may lead to simplified methods for creating objects that are equally effective in conveying information and more rapid scene analysis.

**DP1095383** Prof SJ Berners-Price; Prof NP Farrell

**Approved Project Title** **Probing polynuclear platinum biomolecule interactions**

**2010 :** \$ 90,000

**2011 :** \$ 80,000

**2012 :** \$ 100,000

**Primary RFCD** 2502 INORGANIC CHEMISTRY

**Administering Organisation** 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 with 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.

**DP1092615** A/Prof SM Broomhall; Dr J Van Gent; Dr S Protschky; Prof Dr M Hohkamp

**Approved Project Title** **Gender, power and identity in the early modern Nassau family**

**2010 :** \$ 150,000

**2011 :** \$ 88,000

**2012 :** \$ 115,000

**2013 :** \$ 106,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**APD** Dr S Protschky

**Administering Organisation** The University of Western Australia

**Project Summary**

Our family identities shape our experiences of relationships, support structures, and interactions in broader communities around us but how do gender and power relationships affect expressions of family identities? Our project uses a case study of the early modern Nassau-Orange family, whose extensive and diverse sources include letters, art, architectural precincts, naming patterns, and even colonial endeavours. The word and colour orange today symbolise Protestantism and the Dutch worldwide as a result of this pivotal family's self-presentation in the early modern period. We will produce monographs, PhD thesis, and research training in an international humanities team led by Australian researchers.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1095681** Dr DJ Butler

**Approved Project Title** **Investigating imprecision in preferences and its possible consequences for economics and economic choices**

**2010 :** \$ 35,719  
**2011 :** \$ 31,691  
**2012 :** \$ 24,907

**Primary RFCD** 3401 ECONOMIC THEORY

**Administering Organisation** The University of Western Australia

### Project Summary

When people's preferences are not clear, their choices become variable and susceptible to theoretically irrelevant influences. Examples can be found in surveys of preferences intended to inform public policy in areas such as health, safety and the environment. Understanding the nature of imprecision in people's values and choices is also likely to be crucial for consumers' ability to advance their interests in our complex, choice-filled society. We plan to draw out some of the implications of our experimental work on preference imprecision for consumer behaviour and existing business practices, including the regulation of fair trading.

**DP1094835** Prof KW Clements; Prof R Tyers

**Approved Project Title** **Commodity booms and busts: Implications for the Australian economy**

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

**Primary RFCD** 3402 APPLIED ECONOMICS

**Administering Organisation** The University of Western Australia

### Project Summary

In 2007-08 the share of mining in Australia's Gross Domestic Product (GDP) was the highest for at least four decades and mining investment had more than doubled over the previous four years, now accounting for one-quarter of all private investment. This, and accompanying surges in employment and economic growth, came courtesy of a spectacular surge in global mineral, energy and agricultural commodity prices. Controversy still surrounds the causes of the most recent and previous commodity booms and busts. The results from this proposed project would aid policy making and business decisions in commodity sectors, particularly with respect to the roles of supply-side constraints and the approval processes for new Australian resource development projects.

**DP1093209** Prof DV Day

**Approved Project Title** **Longitudinal, multilevel, and multi-study tests of an integrative theory of leader development**

**2010 :** \$ 70,000  
**2011 :** \$ 70,000  
**2012 :** \$ 75,000

**Primary RFCD** 3502 BUSINESS AND MANAGEMENT

**Administering Organisation** The University of Western Australia

### Project Summary

Leadership plays a critical role in the success of organizations and societies. The behaviours, decisions, and actions of leaders determine the overall quality of leadership. Having the most effective and efficient leader development interventions is important to strengthening the social and economic fabric of Australia. Preparing individuals to participate fully in leadership roles and processes will enhance the effectiveness of organizations of all types. In addition, there is national benefit in developing leaders who are better prepared to tackle the myriad challenges facing Australia, such as building an environmentally sustainable society, creating the frontier industry technologies, and safeguarding Australia.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1097108** Prof JM Dell; Dr A Keating; Dr M Martyniuk; Mr J Bowers

**Approved Project Title** **New multiplexed optical read-out technologies for micromachined cantilever sensor arrays**

**2010 :** \$ 80,000

**2011 :** \$ 50,000

**2012 :** \$ 50,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Western Australia

### Project Summary

Passive sensing of chemical and biological agents is an essential capability in fields as diverse as national security, agriculture, mining and medicine. In many cases, generic sensing (e.g. are there pesticides present) as well as specific sensing (which pesticide) are both important. While sensors based on micro-electromechanical systems (MEMS) have shown extremely high performance at low cost, they have been limited to detection of a specific substance. Success in this project will make low cost generic MEMS-based sensors a reality, allowing, for the first time, wide-spread use of sensitive sensing systems in applications such as farming, container transport security, general medical practice and national security.

**DP1096846** Prof L Faraone; Dr J Antoszewski; A/Prof S Krishna

**Approved Project Title** **Investigation of vertical magneto-transport in infrared detector structures based on InAs/GaSb type-II superlattices**

**2010 :** \$ 165,000

**2011 :** \$ 140,000

**2012 :** \$ 180,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Western Australia

### Project Summary

Infrared sensors and systems are finding increasing use in Australia's core industries: particularly defence, mineral exploration, environmental monitoring, precision agriculture, homeland security, and medical diagnostics. Due to the reduced cooling requirements, the Infrared detector structures to be investigated in this project have the potential to deliver high performance infrared technology at a significantly lower cost and, hence, widening its applications. The new science proposed in this project, and new technological knowledge expected from its application, will allow Australian researchers to participate and significantly contribute to the international effort in this field and to exploit any developed intellectual property.

**DP1094845** Dr R Firman; Prof LW Simmons

**Approved Project Title** **Sperm competition, sexual conflict, and gamete evolution in mice**

**2010 :** \$ 130,000

**2011 :** \$ 130,000

**2012 :** \$ 130,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

APD Dr R Firman

**Administering Organisation** The University of Western Australia

### Project Summary

The innovative experiments of this project will yield results that are at the forefront of research in evolutionary biology. This project will generate publications in high profile journals, and will foster collaborations between Australian and European researchers, creating a significant international impact and promoting excellence in Australian research. Since European settlement of Australia, sixty percent of the native rodent species have become extinct or are threatened with extinction. As there is a significant lack of research on the mating systems of Australian rodents, our investigations on a native mouse will generate information that will be extremely valuable to the national conservation efforts of threatened rodent species.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1096253** Dr JL Fitzpatrick

**Approved Project Title** **Inbreeding: what are the reproductive costs and how are they avoided?**

**2010 :** \$ 120,000

**2011 :** \$ 115,000

**2012 :** \$ 115,000

**Primary RFCD** 2707 ECOLOGY AND EVOLUTION

**APD** Dr JL Fitzpatrick

**Administering Organisation** The University of Western Australia

### Project Summary

Inbreeding in animal populations will undoubtedly become more prevalent in the face of increased habitat fragmentation brought on by human activities and climate change. By increasing our understanding of how inbreeding influences reproductive traits, my research will be directly applicable to conservation programs, specifically by providing insights into how Australia's rich biodiversity will respond to climate change and variability. This project also addresses critical issues in evolutionary biology, thereby contributing towards Australia's reputation as a world leader in this field. Australian science will further benefit through international collaborations and from the training of young scientists.

**DP1096528** Prof AB Fourie; Prof YK Leong; Prof M Fahey

**Approved Project Title** **The evolution of effective stress in sedimenting clayey slurries**

**2010 :** \$ 135,000

**2011 :** \$ 110,000

**2012 :** \$ 120,000

**Primary RFCD** 2908 CIVIL ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

Activities such as water treatment, mining and dredging produce enormous volumes of semi-solid waste annually. The safe and environmentally responsible management of these wastes is costly, consumes vast quantities of water, and sterilises large areas of land. We will address these issues through understanding and manipulating the interaction between individual particles in these slurries to produce desired engineering outcomes. This will be done by developing a laboratory testing column in which the gain in strength and rigidity of a settling slurry are fully characterised, enabling an improvement in design of safe and economical impoundment structures for these waste materials.

**DP1092538** Dr D Franklin; Prof CE Oxnard; Prof RJ Watling; Prof P O'Higgins; Dr A Cardini; A/Prof J Hoogewerff; Mr H Green; Prof M Marks

**Approved Project Title** **Novel approaches to the forensic identification of human remains: integration of studies of bone form and chemistry**

**2010 :** \$ 150,000

**2011 :** \$ 130,000

**2012 :** \$ 130,000

**Primary RFCD** 3703 ANTHROPOLOGY

**Administering Organisation** The University of Western Australia

### Project Summary

In a global era of terrorism, crime and even natural disasters, new approaches to identify victims, and prosecute offenders, are greatly required and long overdue. The combination of new computer and chemical methods will help identify unknowns, reconstruct missing parts and separate commingled remains. Its affect on understanding bones may be like that of DNA on soft tissues. The results will update our ability as forensic scientists to strengthen Australian security systems by improving our ability to manage accidents, disasters, terrorism and crime. This project will start international collaborations and train a new generation of Australian forensic experts.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094024** A/Prof DJ Green; Dr LH Naylor  
**Approved Project Title** **Impact of shear stress on vascular adaptations in humans**  
**2010 :** \$ 75,000  
**2011 :** \$ 75,000  
**2012 :** \$ 75,000  
**Primary RFCD** 3214 HUMAN MOVEMENT AND SPORTS SCIENCE  
**Administering Organisation** The University of Western Australia

### Project Summary

Large arteries are important for the delivery of blood and oxygen to organs such as the heart and brain. A primary physiological stimulus which controls the size and function of these crucial arteries is the magnitude of flow or, more accurately, shear force that the inner wall of the artery is exposed to. We have developed novel software which enables non-invasive assessment of arterial wall velocity, diameter and blood flow. We will assess the impact of acute and chronic changes in wall flow and shear on arterial size and function. We will also develop new software which measures other aspects of artery wall behaviour. These basic human physiology studies have direct implications for assessment of artery health in humans.

**DP1096439** Prof H Hao  
**Approved Project Title** **Experimental and numerical study of dynamic properties of concrete and fibre reinforced concrete materials**  
**2010 :** \$ 120,000  
**2011 :** \$ 110,000  
**2012 :** \$ 110,000  
**Primary RFCD** 2908 CIVIL ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

Recent disastrous examples of life and economy loss due to terrorist action or accident explosion include Bali bombing and Western Australia gas explosion. Reliable prediction of structure response to blast and impact loads is essential for life and economy protection against such loads. This project will perform laboratory tests and numerical simulations to study the construction material properties under dynamic loading conditions, and develop numerical models for accurate predictions of structure response to blast loads. The project contributes to the integrated effort for a secure Australia. It will result in enormous savings from conducting blast tests and will have applications in civil, mining and defence engineering.

**DP1092690** Prof JG Hartnett; Prof ME Tobar; Prof EN Ivanov; Dr K Benmessai; Prof C Salomon; Dr J Jaeckel; Prof JA Lipa; Prof A Peters; Dr PT Fisk; Dr RB Warrington; Dr G Santarelli  
**Approved Project Title** **Precision time and frequency in the lab and in space to test fundamental physics**  
**2010 :** \$ 250,000  
**2011 :** \$ 250,000  
**2012 :** \$ 250,000  
**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES  
APD Dr K Benmessai  
**Administering Organisation** The University of Western Australia

### Project Summary

This project gives Australia the opportunity to be involved in the world's best time comparison experiment ever conceived using the European Space Agency's ultra-accurate atomic clocks in space and the best international network of ground clocks. It strengthens collaboration between the University of Western Australia and world elite metrology institutes, including Paris Observatory, Ecole Normale Superior, the National Measurement Institute, the French Space Agency, and Humboldt, Stanford and Durham Universities. It involves cutting edge research that will test relativity, particle physics and fundamental constants that may well lead to fundamental changes to our laws of Nature and the Universe.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094413** Prof RJ Hobbs; Dr MM Mayfield; Prof RD Holt  
**Approved Project Title** **Novel species interactions arising from synergistic environmental changes**  
**2010 :** \$ 150,000  
**2011 :** \$ 160,000  
**2012 :** \$ 150,000  
**Primary RFCD** 2707 ECOLOGY AND EVOLUTION  
**Administering Organisation** The University of Western Australia

### Project Summary

Synergistic environmental changes, including climate and land use change, are altering Australia's ecosystems and creating novel species assemblages. We know little about how these assemblages develop and function, and yet they are likely to become more pervasive and provide a significant conservation and restoration challenge. We aim to improve our understanding of the factors affecting the creation of novel plant assemblages (through invasions and changes in species' ranges) in the York Gum woodlands of Western Australia. We will examine how novel assemblages function, improve the ability to predict potential ongoing changes in assemblages and provide guidance for the management of these and other internationally important plant communities.

**DP1096764** Dr Y Hu; Prof MJ Cassidy; Prof DJ White  
**Approved Project Title** **Design of Offshore Foundations with Large Penetration into Multilayered Soils**  
**2010 :** \$ 140,000  
**2011 :** \$ 130,000  
**2012 :** \$ 140,000  
**Primary RFCD** 2908 CIVIL ENGINEERING  
**Administering Organisation** The University of Western Australia

### Project Summary

The outcomes of this research will allow safer and more efficient extraction of oil and gas in Australian waters. Offshore oil and gas development is a key Australian industry, annually contributing over A\$21 billion to the economy, and underpinning much of our prosperity. The new numerical models and design guidelines will allow rigs and platforms to operate more safely and efficiently in our challenging seabed conditions, contributing to the future competitiveness of our oil and gas industry, and securing energy supplies for sustained growth of our economy. The project will advance Australia's leadership in the science of offshore geotechnical engineering and foster research training opportunities for future engineering leaders.

**DP1093000** Dr DD Huang; Dr Q Guo  
**Approved Project Title** **Designing Bandwidth-Efficient High-Speed Underwater Acoustic Communication Systems with Block-by-Block Turbo Processing**  
**2010 :** \$ 85,000  
**2011 :** \$ 85,000  
**2012 :** \$ 85,000  
**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES  
**Administering Organisation** The University of Western Australia

### Project Summary

Australia has one of the largest exclusive economic zones in the world, and it is vitally important for Australia to understand and benefit from the oceans. This project will give new perspectives in developing underwater acoustic communications that are important for marine industries and scientific research in areas such as the exploration and exploitation of offshore oil and gas, and ocean environment and climate monitoring. This project will lift the international profile of Australia in underwater acoustic communications research and, through the training of early career researchers and PhD students, this project will also develop a skills base for Australia in underwater acoustic communications.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1096728** Prof J Imberger

**Approved Project Title** **Assessment of the Mass Flux in a Benthic Boundary Layer of a Stratified Lake**

**2010 :** \$ 184,393

**2011 :** \$ 21,500

**Primary RFCD** 2911 ENVIRONMENTAL ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

Understanding the underlying processes responsible for Benthic Boundary Layer (BBL) mass flux in stratified lakes is of fundamental ecological importance. By verifying the ability of the current Centre for Water Research hydrodynamics models to reproduce the dynamics of the BBL, Australia will cement its position as an international leader in the development of technologies to guide the management of lakes, reservoirs, estuaries and coastal areas. Furthermore, these water bodies are important sources and sinks of carbon and the extent to which they contribute to the national and international carbon inventory can be assessed using this technology.

**DP1095294** Prof GN Ivey; Asst Prof NL Jones; Asst Prof RJ Lowe; Dr M Ghisalberti; Dr M Meuleners; Dr R Brinkman; Prof JR Koseff

**Approved Project Title** **Extreme tidal forcing of a topographically complex coastal region: the Kimberley, Western Australia**

**2010 :** \$ 170,000

**2011 :** \$ 150,000

**2012 :** \$ 110,000

**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 ocean circulation of the Camden Sound region of the Kimberley, Western Australia. The combination of field and laboratory observations, coupled with numerical modelling will, for the first time, elucidate the influence of the series of islands, reefs and headlands on the circulation and mixing along this coast. This will ultimately provide insight into other similar systems with complex coastal topography, such as the Great Barrier Reef, and provide the frame work to understand the various physical processes that drive the marine ecology of the region.

**DP1096059** Dr M Kostylev; Prof GA Melkov

**Approved Project Title** **Composite magnetic conducting nanomaterials for microwave applications**

**2010 :** \$ 145,000

**2011 :** \$ 90,000

**2012 :** \$ 90,000

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

**Administering Organisation** The University of Western Australia

### Project Summary

Australian science and technology will be a leading participant in the creation of a new, useful technology for microwave and magnetologic applications whose properties arise from integration of metallic magnetic nanoelements with miniature nonmagnetic current conductors. Recent proof-of-concept demonstrations have inspired an explosion of activity on a global scale. In this project, young Australian scientists and research students will have opportunities to receive training and become involved in a National Priority Frontier Technology rich in possibilities for generation of intellectual property.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1096372** A/Prof SM Kuzenko; Prof UG Lindstrom; Prof AA Tseytlin

**Approved Project Title** **Quantum and Geometric Aspects of Gauge Theories, Supergravity and String Theory**

**2010 :** \$ 190,000  
**2011 :** \$ 185,000  
**2012 :** \$ 200,000  
**2013 :** \$ 100,000  
**2014 :** \$ 100,000

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

APF A/Prof SM Kuzenko

**Administering Organisation** The University of Western Australia

### Project Summary

A central problem of modern high-energy physics is the unification of gravity with the other fundamental interactions that is consistent at the quantum level. Led by a team of internationally recognized experts, this project will yield breakthroughs in supergravity and string theory - 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 Large Hadron Collider.

**DP1094500** A/Prof AN Luiten; Dr EF May; Dr M Moldover; Dr C Daussy

**Approved Project Title** **Redefining Temperature**

**2010 :** \$ 220,000  
**2011 :** \$ 180,000  
**2012 :** \$ 170,000

**Primary RFCD** 2404 OPTICAL PHYSICS

**Administering Organisation** The University of Western Australia

### Project Summary

The international system of units, which is at the basis of every accurate measurement, requires coherent definitions for its basic units (eg. metre, second, kelvin). Unfortunately, at the moment this is not so, and a global call has gone out to redefine every basic unit in terms of fundamental constants, which are by definition the same anywhere and anytime. This project will develop a new laser-based approach to measuring temperature which can be widely deployed and uses fundamental principles for its operation: this can bring accuracy to thermometry in industry for the first time. These outcomes will generate high-level recognition for this Australian project and provide opportunities for high level research training.

**DP1096639** Dr PC Maddern; Dr SL Tarbin; Dr C Jarzebowski

**Approved Project Title** **Living as a child: children's experiences in England c. 1400-1750**

**2010 :** \$ 114,000  
**2011 :** \$ 133,000  
**2012 :** \$ 109,000  
**2013 :** \$ 32,000

**Primary RFCD** 4301 HISTORICAL STUDIES

**Administering Organisation** The University of Western Australia

### Project Summary

How we best nurture and socialize the next generation of Australians is currently a matter of critical debate. Yet modern Australian attitudes to childhood and practices of child-rearing were first formed in the crucible of pre-modern Europe. Our proposed history of children's experiences in England c. 1400-1750 will provide a rich understanding of the foundations of present-day theories and practices of child-rearing. It will enable us to distinguish universal features of child-rearing from those which change over time, and to maintain Australia's international reputation for top-class research and research training in pre-modern history and culture.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1094143** A/Prof P Mead; Prof G McMullan

**Approved Project Title** **Monumental Shakespeare: a transcultural investigation of commemoration in 20th-century Australia and England**

**2010 :** \$ 78,000

**2011 :** \$ 74,000

**2012 :** \$ 62,000

**Primary RFCD** 4202 LITERATURE STUDIES

**Administering Organisation** The University of Western Australia

### Project Summary

Shakespeare represents a key conduit of Anglo-Australian cultural definition. This first internationally collaborative investigation of the popular, political and scholarly influences at work in the desire to commemorate Shakespeare in the 20th century - beginning with the tercentenary of his death in 1916 - will produce new knowledge about the embedding of Shakespeare into English and Australian cultural foundations. This transcultural investigation of the ways in which very different memorials - the National Theatre (London) and Sydney's Shakespeare Place - emerged from debates over appropriate forms for memorialisation will provide new understandings of the reproduction of Shakespearean heritage across nations, hemispheres and cities.

**DP1093154** A/Prof PH Morgan

**Approved Project Title** **Kadare post Communism: Albania, the Balkans and Europe in the Work of Ismail Kadare, 1990-2008**

**2010 :** \$ 70,000

**2011 :** \$ 33,000

**2012 :** \$ 97,000

**Primary RFCD** 4202 LITERATURE STUDIES

**Administering Organisation** The University of Western Australia

### Project Summary

Albanians make up a small but important segment of multicultural Australia. Through the work of Albania's greatest writer and intellectual, Ismail Kadare, we can come to a better understanding of Albanians, their history and culture, and hence of Australia as a multicultural entity. Moreover traditionally Islamic Albania, with its Ottoman history and culture, is seeking inclusion into the European Union, Australia's major partner in trade, tourism, education and culture. Kadare's post-communist works on the subjects of Europe, Islam, Muslims and the West, and Balkan politics and history provide a valuable lesson on the interrelationships of politics, culture and patriotism in a global context for contemporary Australia.

**DP1096801** Prof RA Owens; Dr AS Mian

**Approved Project Title** **Person identification from multiple non-invasive iris and face biometrics in video**

**2010 :** \$ 125,000

**2011 :** \$ 130,000

**2012 :** \$ 135,000

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

**Administering Organisation** The University of Western Australia

### Project Summary

This project will undertake research to develop a prototype system for personal identification that can be used by law enforcement and security agencies to enrol people at points of entry at public places. The system will non-invasively acquire face and iris biometrics and match them against a database of known persons. The proposed system can be used in sensitive buildings for access control, eliminating the need to carry access cards or remember passwords. This research contributes to the national research priority of Safeguarding Australia. We will develop new techniques in computer vision and train new researchers in this area.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1092810** Prof CL Raston; Asst Prof F Rosei

**Approved Project Title** **Integrated approach to functional carbon based materials**

**2010 :** \$ 310,000  
**2011 :** \$ 320,000  
**2012 :** \$ 340,000  
**2013 :** \$ 250,000  
**2014 :** \$ 100,000

**Primary RFCD** 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)  
APF Prof CL Raston

**Administering Organisation** The University of Western Australia

### Project Summary

Exploiting novel forms of carbon to create new technologies for the energy, health and environmental sectors is a major challenge in nanotechnology. To address this challenge we will exploit innovative methods such as self-assembly and continuous flow spinning disc processing. Our proposed research will make significant contributions to a fundamental understanding of carbon nanomaterials. To this end, we will bring together international expertise with complementary skills, providing a more inventive research culture and excellent opportunities for training young scientists. The attractive low cost of renewable starting materials and small footprint of the ensuing technologies will provide a platform for fostering links with industry.

**DP1094217** Prof CL Raston; Prof SA Dunlop; Prof AR Harvey; Dr G Plant; Dr K Stubbs

**Approved Project Title** **Targeted enzymatic treatment of the injured central nervous system using innovative nanotechnology**

**2010 :** \$ 165,000  
**2011 :** \$ 165,000  
**2012 :** \$ 165,000

**Primary RFCD** 2705 ZOOLOGY

**Administering Organisation** The University of Western Australia

### Project Summary

Nanotechnology and other frontier areas in science have exciting potential to solve major challenges of the 21st century, including health. The proposed research provides the real possibility of discovering ways to alleviate the many complex problems associated with neurotrauma following, for example, brain and spinal cord injury. Current delivery of therapeutics do not work effectively and new approaches are urgently needed. The recently established powerful multidisciplinary research team combines expertise in nanotechnology, glycobiology and neuroscience to develop novel, safe ways to deliver therapeutic enzymes over biological time-courses. We aim to make broken connections work again, while providing quality research training.

**DP1094050** Prof Dr K Regenauer-Lieb; Dr RF Weinberg; Dr G Rosenbaum; Prof G Manatschal

**Approved Project Title** **The dynamic strength of continents and how they break apart**

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

**Primary RFCD** 2601 GEOLOGY

**Administering Organisation** The University of Western Australia

### Project Summary

Sedimentary basins formed as a result of continental extension are the source of many oil and gas and geothermal resources. The geometries of the deepest part of these basins and their temporal and thermal evolution, are essential for basin prospectivity, but can seldom be investigated directly. This Australia-based project is expected to overhaul how we understand continental deformation, which is a crucial, but relatively vaguely understood, component of plate tectonics. By modelling continental extension, the project will improve our understanding of basin development, deep geometry, and heat distribution, providing the basis for new applied and specific research projects directed at enhancing energy resource exploration.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1096178** Prof DD Sampson; Prof MB Bush; Prof S Boppart

**Approved Project Title** **Optical coherence elastography - High-resolution medical imaging of tissue mechanical properties**

**2010 :** \$ 140,000

**2011 :** \$ 150,000

**2012 :** \$ 100,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

This project brings together an international, multi-disciplinary team to develop innovative, high-resolution techniques to identify diseased tissue. Success will result in a new medical imaging technique allowing clinicians to quantify the mechanical properties of tissue, effectively creating a high-resolution image of what the tissue 'feels' like. This may help them to more accurately identify cancerous tissue during surgery and reduce rates of recurrence. It could aid in tissue engineering and regeneration and will provide a new database of tissue mechanical properties. The project will position Australia as a leader in this newly developing medical imaging technology, with significant potential for commercialisation.

**DP1096525** Prof A Seress; A/Prof C Li

**Approved Project Title** **Efficient computation in finite groups with applications in algebra and graph theory**

**2010 :** \$ 170,000

**2011 :** \$ 170,000

**2012 :** \$ 165,000

**2013 :** \$ 160,364

**2014 :** \$ 160,364

**Primary RFCD** 2301 MATHEMATICS

APF Prof A Seress

**Administering Organisation** The University of Western Australia

### Project Summary

The cutting-edge research of the project will further strengthen Australia's prominent role in computational group theory and algebraic graph theory. Besides the theoretical advances, the project includes the implementation and wide distribution of matrix group algorithms, benefiting immediately the algebraic research community and undergraduate mathematical education.

**DP1092856** Dr MW Shane

**Approved Project Title** **Functional diversity in root systems that are critical for water and nutrient acquisition by Australian monocotyledons**

**2010 :** \$ 125,000

**2011 :** \$ 100,566

**2012 :** \$ 100,566

**2013 :** \$ 100,566

**2014 :** \$ 100,566

**Primary RFCD** 2704 BOTANY

ARF Dr MW Shane

**Administering Organisation** The University of Western Australia

### Project Summary

Specialised root structures facilitate water and nutrient acquisition in grass-like sedges, a major vegetation type on nutrient-poor, intensely weathered soils in Australia. The project will enhance our understanding of key root structures and functional traits for water and nutrient acquisition in various habitats. The identification of such structures and traits will contribute to Australia's excellent international reputation in this discipline. Increased fundamental insight into the strategies of perennial monocotyledons in Australian ecosystems will be directly relevant to difficult cases of landscape restoration on skeletal soils with widely varying water availability and thus addresses the National Research Priority: An Environmentally Sustainable Australia.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1096717** Prof SM Smith; A/Prof EL Ghisalberti; Dr KW Dixon  
**Approved Project Title** **Discovery of the molecular mode of action of karrikins in plants**  
**2010 :** \$ 100,000  
**2011 :** \$ 100,000  
**2012 :** \$ 100,000  
**Primary RFCD** 2704 BOTANY  
**Administering Organisation** The University of Western Australia

### Project Summary

Karrikins are a newly-discovered family of naturally-occurring plant growth regulators that stimulate seed germination and seedling vigour. They were discovered in smoke and while they are centrally important in fire ecology they have far wider significance since species from non-fire-prone regions also respond to karrikins. Our research will discover how karrikins work at the molecular level in plant cells. Our discoveries will be applied to improve growth of crop plants, to stimulate germination of weeds so that they can be eradicated, and in restoration ecology to revegetate degraded land such as minesites. Australia's world-leading position in this new important research area will be enhanced.

**DP1096348** Dr R Togneri; Prof SE Nordholm; Prof M Cooke  
**Approved Project Title** **Robust speech recognition in realistic hostile environments**  
**2010 :** \$ 75,000  
**2011 :** \$ 85,000  
**2012 :** \$ 70,000  
**Primary RFCD** 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING  
**Administering Organisation** The University of Western Australia

### Project Summary

Australia leads the world in the adoption of speech recognition technology but sadly lags in the development of the fundamental advances in the area. This research will help propel Australia to the forefront of new innovations in speech recognition technology and contributions to fundamental science. Our project will provide an excellent training ground for graduate students and researchers, with the real possibility of significant commercial benefit to the nation. The deployment of our system in the community will greatly enhance the defence and police forces ability for surveillance and security, and will provide new assistive aids to improve the quality of life and safety for the elderly and disabled.

**DP1096252** Dr JA Trotter; Dr IS Williams; Em/Prof CR Barnes; Prof DJ Beerling; Dr CH Wellman  
**Approved Project Title** **Global Climate Change, Carbon Dioxide (CO<sub>2</sub>), and the Evolution of Life in the Palaeozoic and Early Mesozoic**  
**2010 :** \$ 125,000  
**2011 :** \$ 115,000  
**2012 :** \$ 115,000  
**Primary RFCD** 2606 ATMOSPHERIC SCIENCES  
APD Dr JA Trotter  
**Administering Organisation** The University of Western Australia

### Project Summary

A critically important problem directly affecting our society is the effects of climate change on our life support systems and environment. But the impacts of climate change and increasing carbon dioxide (CO<sub>2</sub>) on the Earth's biosphere are not well understood, so much can be learnt from examining past events that have shaped its evolution. Our research will provide important new insights into how life evolved and survived periods of major environmental upheaval in Earth history, especially its responses to large shifts in global temperatures and atmospheric CO<sub>2</sub>. These outcomes will provide valuable input to help project how future global warming and rapidly increasing carbon dioxide levels will likely impact our modern biosphere.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1093877** Prof GJ Venville; Em/Prof P Adey

**Approved Project Title** **Thinking Australia: A cognitive acceleration program to raise high school students' achievement in science**

**2010 :** \$ 127,000

**2011 :** \$ 107,000

**2012 :** \$ 100,000

**Primary RFCD** 3302 CURRICULUM STUDIES

**Administering Organisation** The University of Western Australia

### Project Summary

The outcome of the Thinking Australia project will be a cognitive acceleration program consistent with the national science curriculum, contextualised in cutting edge science and delivered with modern technologies. The program will be theory driven, evidence based and consistent with neuroscience research. The national benefit will include improved outcomes on international tests, improved quality of science education and thinking skills for Australia's future scientists and citizens, improved student attitudes, and increased enrolments in school science. Developing and fostering human talent is essential to promoting an innovative culture and economy.

**DP1093510** Prof AM Waite; Dr M Roughan; Prof CB Pattiaratchi; Dr J Kotta; Dr H Orav-Kotta

**Approved Project Title** **Ocean-reef interactions as drivers of continental shelf productivity in a changing climate**

**2010 :** \$ 189,000

**2011 :** \$ 189,000

**2012 :** \$ 125,000

**Primary RFCD** 2604 OCEANOGRAPHY

**Administering Organisation** The University of Western Australia

### Project Summary

Poor coastal management results in the irreparable destruction of reef systems' function and biodiversity, nationally and globally. To manage marine resources effectively we must implement sustainable practices, including forward planning in the context of climate change. A critical limitation in determining appropriate actions is a poor understanding of mechanisms driving productivity. Our project will provide key information on the oceanographic mechanisms supporting Australia's coastal systems, linking nutrient supply, physical drivers and climate. By linking all these factors we will both assist in determining appropriate ecosystem management, and provide a knowledge base to support adaptation to future changes in Australia's climate.

**DP1096514** Dr VP Wallace; Dr P Siegel

**Approved Project Title** **Terahertz and optical coherence tomography for improved cancer imaging**

**2010 :** \$ 80,000

**2011 :** \$ 55,000

**2012 :** \$ 50,000

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

**Administering Organisation** The University of Western Australia

### Project Summary

This project aims to improve cancer imaging by combining two complimentary, novel techniques. Its success will create an internationally leading position for Australia in cutting-edge research in optical and terahertz biomedical imaging. This innovative, fundamental research will expand Australia's research capacity in imaging sciences. The nation will benefit from new medical diagnostic techniques that will improve the detection and treatment of cancer; as well as aid the clinical assessment of burns. This multidisciplinary, internationally collaborative research has additional wide ranging benefits in biology, medicine, pharmaceutical science and national security.

## Summary of Discovery Projects Proposals for Funding to Commence in 2010

**DP1092893** Dr A Wittek; Prof K Miller; Prof KH Yang

**Approved Project Title** **Towards Consistent Meshless Computational Framework for Soft Tissue Damage Modelling for Traumatic Injury Prevention and Surgery Simulation**

**2010 :** \$ 95,000

**2011 :** \$ 85,000

**2012 :** \$ 80,000

**Primary RFCD** 2915 BIOMEDICAL ENGINEERING

**Administering Organisation** The University of Western Australia

### **Project Summary**

Deaths and injuries due to car crashes cost our society \$18 billion per annum. This project will provide enabling computer simulation technology for reducing this cost by improving car crash safety through more accurate evaluation of injury risk as well as by reducing the risk of adverse effects in surgical procedures through better surgical training and surgery planning. We will deliver this technology by creating a computational framework for modelling of soft tissue damage due to traumatic rupture and surgical dissection. This framework will enable building accurate computer models of the human body injury responses for safe car design as well as models for assisting surgeons by predicting forces and deformations in tissue dissection.

**DP1092913** Prof Y Wu; Prof DV Marinova

**Approved Project Title** **Energy efficiency, economic growth and the environment in China**

**2010 :** \$ 121,000

**2011 :** \$ 111,000

**2012 :** \$ 125,000

**Primary RFCD** 3402 APPLIED ECONOMICS

**Administering Organisation** The University of Western Australia

### **Project Summary**

This project will provide Australian government, business and the broader community with comprehensive knowledge about China's growth which is closely linked to the Australian resources boom and hence economic growth in recent years. It will give Australia a leading edge in understanding China within the context of sustainable development and provide an assessment of the impact that China's continued growth may have on the world in general and on the Australian economy in particular. The insights on China's energy and environmental sectors gained through this project will be vital for Australian businesses attempting to tap into the Chinese market, and Sino-Australian cooperation on climate change.