

# Summary of Linkage International Fellowships Proposals

## New South Wales

### The University of New South Wales

**LX0881956** Dr M Jormakka; Prof G Von Heijne; Prof PM Curmi; Dr MJ Rapp

**Approved Project Title** **A rational approach to a high-resolution structure of the multidrug transporter EmrE**

**2008 :** \$ 70,540

**Primary RFCD** 2499 OTHER PHYSICAL SCIENCES

#### Collaborating Countries

Sweden

**Administering Organisation** The University of New South Wales

#### Project Summary

Membrane proteins form only 0.3% of the available protein structures in the protein data bank (PDB), yet 30% of the proteins in the human genome and 50% of human drug targets are membrane proteins. Multidrug transporters are membrane proteins responsible for antibiotic resistance in humans. A high-resolution structure of a multidrug resistance protein, together with comprehensive biochemical characterization, would enable a detailed understanding of how these protein functions. Potentially it could also aid in the development of specific inhibitors that would prevent EmrE (and perhaps other similar proteins) from carry out its harmful mission.

**LX0881924** Prof IH Sloan; Prof Dr M Griebel

**Approved Project Title** **Lifting the curse of dimensionality - bringing together the quasi Monte Carlo and sparse grid methods**

**2008 :** \$ 39,324

**Primary RFCD** 2301 MATHEMATICS

#### Collaborating Countries

Germany

**Administering Organisation** The University of New South Wales

#### Project Summary

This project is expected to lead to improved methods for handling high-dimensional problems (i.e. problems with many variables) that arise in finance, statistics, commerce, physics, and many other fields. In turn this could lead to significant economic benefit, especially to high-value service industries such as the finance industry. By strengthening international collaboration, it will also help to maintain Australia's strong position in international research in the mathematical sciences.

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## The University of Sydney

**LX0882079** A/Prof RJ Fletcher; Dr A Traviglia; Dr IR Johnson; Mr DH Evans

**Approved Project Title** **Mapping the past using advanced technologies: Satellite applications for uncovering archaeological remains at Angkor**

**2008 :** \$ 98,457

**Primary RFCD** 4302 ARCHAEOLOGY AND PREHISTORY

### Collaborating Countries

Italy

**Administering Organisation** The University of Sydney

### Project Summary

The University of Venice is a leader in remote sensing in archaeology, particularly the use of multispectral image analysis, while Australian researchers are at the forefront of research in Cambodia in a number of fields. Australia will benefit in particular from the transfer of expertise in remote sensing archaeology from Europe, where the use of these methods in archaeology is very well-established. This project will provide an excellent opportunity for the transfer of knowledge and expertise between the two groups; provide a framework for enduring cooperation; and enhance Australia's reputation as a leader in innovative applications of technology in the humanities and social sciences.

**LX0881904** A/Prof DS Jeng; Prof P Liu

**Approved Project Title** **Coupled models for waves, a porous seabed and breakwater interactions**

**2008 :** \$ 67,984

**Primary RFCD** 2912 MARITIME ENGINEERING

### Collaborating Countries

USA

**Administering Organisation** The University of Sydney

### Project Summary

Design of coastal structures such as breakwaters has demanded more accurate and reliable methods for the evaluation of the stability of structures and their foundations. Stability of the breakwater and its foundation is the first key issue for practical engineers. This project will establish the first fully coupled model for wave-seabed-structure interaction. The proposed study will not only enhance the understanding of the complex system, which is an area of vital interest for design of coastal structures, but also contribute to the national development and competitiveness in ocean exploration, reduce the risk of potential environmental damage caused by failure of breakwaters and produce high quality research students.

**LX0882612** Prof DR McKenzie; Dr M Lattemann; Prof U Helmersson

**Approved Project Title** **Physics of High Power Pulsed Plasmas for Materials Synthesis**

**2008 :** \$ 78,648

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

### Collaborating Countries

Sweden

**Administering Organisation** The University of Sydney

### Project Summary

The new science produced will have a direct benefit on the synthesis of a new generation of materials for many applications, such as transparent conductive oxides, multilayer structures, and heat mirror materials for glazings. Many of these materials will help reduce energy consumption in the built environment and hence Australia's emission of greenhouse gases. Furthermore, it will help to develop environmentally clean production methods for many existing as well as new applications by replacing liquid based production techniques such as electroplating which generate toxic liquid wastes.

## Summary of Linkage International Fellowships Proposals

**LX0882808** Dr PG Tuthill; Dr S Lacour  
**Approved Project Title** **New technologies for the DRAGONFLY instrument**  
**2008 :** \$ 83,148  
**Primary RFCD** 2401 ASTRONOMICAL SCIENCES

### **Collaborating Countries**

France

USA

**Administering Organisation** The University of Sydney

### **Project Summary**

The vast distances in the galaxy have motivated the long-held dream of astronomers to build telescopes with enough magnification to zoom in on the intimate lives of stars. With a bold new approach, the Dragonfly instrument will make a major step in performance beyond existing technology, delivering images with an unmatched combination of high fidelity and resolution. A number of crucial questions await such a breakthrough in capability. How do stars form? What happens as they die? Are planetary systems common? Demonstrated success with this instrument will place it at the forefront of astronomical imaging worldwide, providing a vital element in the case for justifying the next generation of large telescopes.

## Summary of Linkage International Fellowships Proposals

### University of Wollongong

**LX0881933** Prof MM Olsson; Prof S Edwards; Dr GA Nevitt; Dr TW O'Dwyer

**Approved Project Title** **The major histocompatibility complex and scent-mediated mate choice in a Procellariiform, Gould's petrel**

**2008 :** \$ 92,198

**Primary RFCD** 2702 GENETICS

#### Collaborating Countries

USA

**Administering Organisation** University of Wollongong

#### Project Summary

In Australia, there are 25 species of Procellariiformes listed as threatened or endangered under the Environment Protection and Biodiversity Conservation Act 1999. Formulating comprehensive conservation plans for endangered species requires a good understanding of the species' breeding biology yet virtually nothing is known about the mechanisms involved in mate choice in the procellariiforms. A better understanding of the traits these long-lived birds use when choosing their lifelong breeding partner could greatly benefit conservation strategies designed to protect them. This could be particularly beneficial where translocation is an option because birds being translocated could be assessed for compatibility prior to translocation.

**LX0881953** Prof MR Wilson; Mr JJ Yerbury; Prof CM Dobson; Dr DC Crowther; Dr JR Kumita

**Approved Project Title** **The effects of alpha-2-macroglobulin on amyloid formation and toxicity**

**2008 :** \$ 92,476

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

#### Collaborating Countries

UK

**Administering Organisation** University of Wollongong

#### Project Summary

The expected outcomes will provide major advances in understanding how the abundant human blood protein alpha-2-macroglobulin influences the formation of protein aggregates that underpin a number of serious diseases (e.g. Alzheimer's disease). The linkages involved are of the highest calibre and will give the Fellowship holder a unique opportunity for training in environments that are truly internationally leading-edge. Furthermore, the very high novelty and broad significance of this work indicate that it will produce high-impact publications which will tangibly assist Australia being recognized as a major contributor to international research outcomes of the highest quality.

**LX0881899** Prof C Zhang; Prof F Liu

**Approved Project Title** **Design and Creation of Nanomechanical Architectures from Folding of Ultrathin Bi-layer Films**

**2008 :** \$ 117,972

**Primary RFCD** 2918 INTERDISCIPLINARY ENGINEERING

#### Collaborating Countries

USA

**Administering Organisation** University of Wollongong

#### Project Summary

The project will achieve progress in designing, modelling, analyzing, and characterization of nanomechanical architectures that will have broad application in Australian science and industry. If successful, our research will revolutionize nanofabrication technology and nano-design methods. The project will lead to a scientific understanding of atomic interaction and stress field effect in the formation of nanosystems. The result of this research will significantly lower fabrication costs and enhance the potential of nanomaterials in various areas such as electronics and bioelectronics, telecommunication, medical instrumentations, and pharmaceutical design.

## Summary of Linkage International Fellowships Proposals

### Victoria

#### Monash University

**LX0882660** Prof H Schmidt; Dr PM Schmidt; Dr BK Kemp-Harper; Dr J Stasch

**Approved Project Title** **Sensing atmosphere: Understanding the HNOX-protein gas-sensing capability and how it is affected by heme-oxidation.**

**2008 :** \$ 108,543

**Primary RFCD** 2701 BIOCHEMISTRY AND CELL BIOLOGY

#### Collaborating Countries

Germany

**Administering Organisation** Monash University

#### Project Summary

The project investigates how gas sensing heme-proteins from the novel HNOX (Heme-Nitric Oxide) family are able to discriminate between different gaseous ligands such as O<sub>2</sub> and NO and how oxidation of the heme alters this response. The gas-sensing capability of the HNOX proteins is crucial for organisms ranging from bacteria to humans. Thus, understanding of these signalling mechanisms will have a strong impact on many scientific fields from the control of pathogen growth to human blood pressure regulation. This collaboration will establish Australian scientists and as world-leading in the field of NO and redox signalling. This development will also be of substantial benefit for the training of the next generation of Australian students and scientists.

## Summary of Linkage International Fellowships Proposals

### The University of Melbourne

**LX0882231** Dr M Hu; A/Prof RB Gasser; Prof PW Sternberg

**Approved Project Title** **Using integrated frontier and smart technologies to identify new drug targets for parasites causing major diseases in humans and animals**

**2008 :** \$ 91,148

**Primary RFCD** 2702 GENETICS

#### Collaborating Countries

USA

**Administering Organisation** The University of Melbourne

#### Project Summary

The national/community benefits are (1) enhanced focus on animal and human health biotechnology through the development of anti-parasite compounds and/or vaccines; (2) improved and sustainable control of important parasites with decreased risk of induction of drug resistance; (3) increased profitability of agricultural animal production; (4) consolidation of a technology platform for further applications in genomics and post-genomics of pathogens of global significance and construction of a pipeline for the validation of drug targets; (5) capturing the benefits from fundamental research and strengthening links between fundamental and applied research; (6) increasing the quality and quantity of scientifically skilled people in biotechnology.

**LX0882635** Prof RA O'Hair; Dr L Feketeová

**Approved Project Title** **Gas phase studies of the interactions of electrons with peptide ions: structure assignment and fundamentals**

**2008 :** \$ 83,948

**Primary RFCD** 2503 ORGANIC CHEMISTRY

#### Collaborating Countries

Denmark

**Administering Organisation** The University of Melbourne

#### Project Summary

Electron-induced reactions are fundamental to a wide range of processes that underlie many areas of science and technology, ranging from planetary atmospheres, industrial plasmas to living tissues. Since ionizing radiation is believed to be a major cause of damage to living cells, understanding electron interactions with biological molecules is essential to predict the consequences of exposure. Structure determination of biomolecules is at the heart of identifying, diagnosing and potentially developing treatments for diseases, and thus another important reason for studying these interactions is the potential to develop new mass spectrometry based analytical methods.

**LX0882354** Prof S Praver; Prof A Hoffman

**Approved Project Title** **Electron Emission from Diamond**

**2008 :** \$ 110,676

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

#### Collaborating Countries

Israel

**Administering Organisation** The University of Melbourne

#### Project Summary

Israel is emerging as an international hub of technology with one of the highest rates of R&D in the world. This collaborative project will access one of the world leading experts in diamond science and technology, Professor Alon Hoffman, to exploit the remarkable properties of diamond for a new generation of detectors and devices. Success in this project can lay the groundwork for tapping into the successful record of advanced technologies and venture capital funding that abound in Israel today.

## Summary of Linkage International Fellowships Proposals

**LX0882154** Dr A Zalesky; Dr C Westin; Dr SJ Wood; Dr M Yucel

**Approved Project Title** Computational methods for precise reconstruction of white-matter fibre tracts in the human brain using diffusion tensor imaging

**2008 :** \$ 78,648

**Primary RFCD** 2302 STATISTICS

**Collaborating Countries**

USA

**Administering Organisation** The University of Melbourne

**Project Summary**

One in five Australians will experience a mental illness. This project will facilitate a new method for: (1) brain researchers to advance the fundamental understanding of mental illnesses and brain disorders; (2) medical clinicians to diagnose and assess the growing incidence of mental illness confronting Australia's ageing population, thereby addressing the ageing well and ageing productively national research priority; and, (3) neurosurgeons to guide surgery via localisation of major neural tracts. In addition to contributing to the understanding, diagnosis and treatment of Australia's endemic mental health burden, this project will advance Australia's skill-base and international standing in basic scientific research.

## Summary of Linkage International Fellowships Proposals

### Queensland

#### Queensland University of Technology

**LX0881907** Prof DA Atchison; Prof WN Charman

**Approved Project Title** **Peripheral aberrations of the human eye**

**2008 :** \$ 16,508

**Primary RFCD** 3209 OPTOMETRY

#### Collaborating Countries

UK

**Administering Organisation** Queensland University of Technology

#### Project Summary

This project will benefit Australia from several perspectives. It will make an important contribution to understanding limitations to peripheral vision of the eye, particularly as a result of refractive surgical intervention. This is important because many Australians will require such surgery. Being able to better measure and correct peripheral aberrations will lead to improved imaging of the eye and thus contribute to improved detection and diagnosis of ophthalmic disease. The study will benefit ophthalmologists, optometrists, and engineers involved in designing visual instruments. This project will provide training in adaptive optics for graduate students not available in any other Australian institution.

**LX0881935** Dr BA Hocking; Dr CG Lawson; Prof GL Gilbert; Dr JH Vogel; Prof EC Hui; Prof Dr T Maruhn

**Approved Project Title** **The Implications of the Convention on Biological Diversity for Infectious Diseases: The Case of Indonesia and Avian Flu**

**2008 :** \$ 85,298

**Primary RFCD** 3901 LAW

#### Collaborating Countries

Germany

Hong Kong

Puerto Rico

**Administering Organisation** Queensland University of Technology

#### Project Summary

The proposal dovetails with the ARC's National Research Priority Safeguarding Australia while responding to an identified need for multidisciplinary research in biotechnology, economics, epidemiology, law, and public health. A keen national imperative exists to develop appropriate responses to infectious disease which balances policies predicated upon rule-of-law principles against imperatives to safeguard public health through vaccine R&D.

## Summary of Linkage International Fellowships Proposals

### The University of Queensland

**LX0882427** Prof B Martinac; Asst Prof O Friedrich; Dr B Launikonis; Prof DJ Adams

**Approved Project Title** **Membrane excitability and cellular calcium regulation in the peripheral nervous system under different (patho)-physiological conditions and in inflammatory disease**

**2008 :** \$ 131,306

**Primary RFCD** 3207 NEUROSCIENCES

#### Collaborating Countries

Germany

**Administering Organisation** The University of Queensland

#### Project Summary

Studies of cytokine action on neurons and muscle give new insights into functional responses of the nervous system to systemic inflammation and sepsis. In some countries, sepsis is the third most frequent cause of death following heart attack. Elucidating the pathomechanisms allows to develop therapeutic strategies. Electrophysiology, Ca<sup>2+</sup> regulation and optical membrane potentiometry allow us to monitor early changes in disease on a (sub)cellular level. Experiments on Ca<sup>2+</sup> regulation and ion channel function in muscle with different cholesterol membrane contents will help to understand pathomechanisms in high cholesterol diseases, e.g. obesity, on the membrane level long before cardiovascular effects become prominent.

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## South Australia

### The University of Adelaide

**LX0881950** Prof AD Abell; Dr J Gardiner; Prof Dr D Seebach; Prof RJ Blaikie

**Approved Project Title** **Conformationally constrained and immobilized beta-peptides**

**2008 :** \$ 118,793

**Primary RFCD** 2503 ORGANIC CHEMISTRY

#### Collaborating Countries

NZ

Switzerland

USA

**Administering Organisation** The University of Adelaide

#### Project Summary

The research builds on world-class expertise in Australia (particularly Adelaide) in proteomics to provide a basis for fundamental advances in chemistry that will underpin the development of new pharmaceuticals and smart materials, and future technologies and industries. We create a mix of research at the interface of disciplines within academia and industry, with linkages to the very best international researchers and centres. A new critical mass of expertise in a number of advancing areas of chemistry, biology, and materials science will be introduced to Australia. This will enhance existing strengths and opportunities in proteomics and biomedical research for the treatment of disease.

# Summary of Linkage International Fellowships Proposals

## Western Australia

### The University of Western Australia

**LX0882476** Prof MA Spackman; A/Prof D Jayatilaka; Prof H Bürgi

**Approved Project Title** **A reliable physical model of molecular motion in crystals**

**2008 :** \$ 165,086

**Primary RFCD** 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

#### Collaborating Countries

Switzerland

**Administering Organisation** The University of Western Australia

#### Project Summary

The scientific benefits would flow, in the first instance, to the large national and international communities of scientists whose research makes use of the results of X-ray diffraction experiments. Applications of the research to amino acids and peptides will benefit investigations into the structure and molecular dynamics of biological systems, including proteins and enzymes. Studies of charge densities in crystals will obtain a standard tool for improved modelling of molecular motion, resulting in physically more realistic charge density functions, and hence greater insight into the relationship between properties of crystals and their constituent molecules.

**LX0881900** Prof ME Tobar; Dr JG le Floch; Prof D Cros

**Approved Project Title** **Frequency stabilisation in the Extremely High Frequency band**

**2008 :** \$ 87,283

**Primary RFCD** 2917 COMMUNICATIONS TECHNOLOGIES

#### Collaborating Countries

France

**Administering Organisation** The University of Western Australia

#### Project Summary

All precision communication and measurement systems (i.e. radar and navigation) rely on high quality oscillator technology. Any improvement in oscillator performance has a direct impact on the performance of the system and hence is of potential economic benefit. This project will realise the most stable frequencies ever produced in the underused Extremely High Frequency band, which is also important for space communications and navigation technology. System enhancement will include, better angular resolution, higher bandwidths, faster transmission rates and narrower beam widths without the susceptibility of absorption apparent from the optical domain.

# Summary of Linkage International Fellowships Proposals

## Tasmania

### University of Tasmania

**LX0882789** Prof JE Malpas; Dr KM Thiel

**Approved Project Title** **Genealogy and Topology: A Constellational Comparison of Nietzsche and Heidegger**

**2008 :** \$ 81,373

**Primary RFCD** 4401 PHILOSOPHY

### Collaborating Countries

Germany

**Administering Organisation** University of Tasmania

### Project Summary

This research is fundamental in character addressing basic questions about the nature and history of philosophy. It will have direct academic benefits in advancing disciplinary knowledge, in enhancing the reputation of Australian philosophy in Germany and internationally, and in promoting contact between Australian and German philosophers, but is also likely to have longer term benefits in furthering our understanding of the nature of concepts, and of conceptual creativity.

## Australian Capital Territory

### The Australian National University

**LX0881961** Dr AS Desyatnikov; Prof YS Kivshar; Dr K Bliokh

**Approved Project Title** **Optical and matter-wave vortices in nonlinear and inhomogeneous media**

**2008 :**

\$ 100,643

**Primary RFCD** 2404 OPTICAL PHYSICS

#### Collaborating Countries

Israel

Japan

Ukraine

**Administering Organisation** The Australian National University

#### Project Summary

Wave phenomena of diverse nature have a strikingly similar feature of vorticity, with the energy or matter spiralling around isolated phase singularities. This project targets the fundamental theoretical research in an interdisciplinary field of singular waves transporting vortices in nonlinear and inhomogeneous media. Our project will contribute to the designated priority area "Frontier Technologies for Building and Transforming Australian Industries" by providing fundamental understanding of novel physical phenomena and underpinning technological advances in the fields of photonics, atom, and electron optics, where Australia has built strong expertise and plays a significant role in the international development.