

Summary of Linkage International Fellowships Proposals

New South Wales

The University of New South Wales

LX0989187 Prof IW Dawes; Ms CL Gelling; Prof J Brodsky

Approved Project Title **Role of autophagy in degradation of endoplasmic reticulum (ER)-localised protein aggregates**

2009 : \$ 86,000

Primary RFCD 2701 BIOCHEMISTRY AND CELL BIOLOGY

Collaborating Countries

USA

Administering Organisation The University of New South Wales

Project Summary

This study will provide a new understanding of protein aggregate accumulation in the endoplasmic reticulum (ER), a phenomenon that occurs in aging cells and protein conformational diseases, and under stress conditions and during secretory protein overexpression. This information will inform strategies to prevent the onset of protein conformational diseases and help identify targets for pharmaceutical intervention. In addition, a powerful model system for studies of ER protein aggregation will be established, high-level training in biochemistry and morphometry will be provided, and an international collaboration of the highest calibre will be initiated.

LX0990061 Prof SL Kjelleberg; Dr N Barraud; Prof A Filloux

Approved Project Title **Dynamic signaling pathways of dispersal in bacterial biofilms**

2009 : \$ 57,000

Primary RFCD 2703 MICROBIOLOGY

Collaborating Countries

UK

Administering Organisation The University of New South Wales

Project Summary

This Breakthrough Science project will result in an increased understanding of the molecular processes that govern biofilm development and dispersal. While the outcomes will be directly applicable where *P. aeruginosa* infections continue to cause health-threatening conditions, such as in Cystic Fibrosis chronic infections, it will also be instrumental for the rational design of novel products and strategies to control biofilms of other single species or of mixed species populations in many other settings. Countless environmental, industrial and clinical applications will benefit from improved antimicrobial strategies and reduced usage of antibiotics.

Summary of Linkage International Fellowships Proposals

The University of Newcastle

LX0990077 A/Prof PC Dastoor; Dr W Allison

Approved **Developing the Helium Atom Pinhole Camera**

Project Title

2009 : \$ 46,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

Collaborating Countries

UK

Administering Organisation The University of Newcastle

Project Summary

The tantalising possibility of an optical instrument that uses neutral atom beams to image surfaces, rather than light or electrons, has been a grand challenge in Physics ever since de Broglie first postulated the existence of matter waves. This project seeks to realise this seminal goal using an elegantly simple design based on the concept of a pin hole camera. The successful development of this world-first instrument would represent a significant advance in helium atom microscopy and would significantly enhance the reputation of Australian science. Moreover, this project strengthens and supports a key collaboration between the Universities of Newcastle and Cambridge and is at the core of this emerging technology.

Summary of Linkage International Fellowships Proposals

University of Wollongong

LX0990092 Prof A Bouzerdoum; Prof M Amin

Approved Project Title **Robust Beamforming for Radar Imaging**

2009 : \$ 43,000

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Collaborating Countries

USA

Administering Organisation University of Wollongong

Project Summary

The impact of radar imaging technologies on security and search and rescue operations is indisputable. They play a vital role in safeguarding a country from terrorism and crime, protecting its borders, and predicting adverse weather patterns. Searching for survivors in disaster areas such as earthquakes and fires can greatly benefit from the proposed research. Law-enforcement officers can employ radar imaging technology to enable accurate determination of targets of interest, obstacles, weapons, victims, outlaws, and hostages inside enclosed structures or buildings. The proposed research and its findings will support the development of cutting edge radar imaging research and technology in Australia.

LX0989591 Dr J Kim; Prof SX Dou; Dr G Hong

Approved Project Title **Study on the deposition of superconducting REBCO film via chemical route for coated conductor**

2009 : \$ 143,000

Primary RFCD 2914 MATERIALS ENGINEERING

Collaborating Countries

Korea

UK

Administering Organisation University of Wollongong

Project Summary

Second generation high temperature superconducting (HTS) coated conductor is the essential raw material for the next generation of high-efficiency electric power application such as power transmission cables, transformers, motors and generators, and grid protection devices (FCL) as well as medical, transportation, and high energy physics. The high efficiency and compactness of HTS devices promises great savings in energy and reduction in CO2 emissions, which is vital for decreasing greenhouse effects.

LX0990073 A/Prof AV Pan; Prof TH Johansen

Approved Project Title **Magnetic walls as nano-manipulators for physics, bio- and medical technologies**

2009 : \$ 71,000

Primary RFCD 2402 THEORETICAL AND CONDENSED MATTER PHYSICS

Collaborating Countries

Netherlands

Norway

Administering Organisation University of Wollongong

Project Summary

The focus of this project is the development of new scientific and technological aspects of nanomanipulators allowing not only the effective control of molecules and other magnetic quantities for a new approach in computation, but also the vital influence of biological processes at the molecular level. The outlook of this idea becomes increasingly promising in science and a broad range of industries (electronics, materials engineering, nanotechnology and biotechnology). This project will establish Australia's capability at the forefront in this rapidly advancing area. The outcomes predicted may soon lead to the development of practical devices, where Australian science and industry may play one of the key roles.

Summary of Linkage International Fellowships Proposals

LX0989950 Prof GG Wallace; Dr MP in het Panhuis; Prof P Calvert

Approved Project Title Inkjet printing bio-functional materials

2009 : \$ 95,000

Primary RFCD 2501 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)

Collaborating Countries

USA

Administering Organisation University of Wollongong

Project Summary

The proposed research will benefit existing biomedical industries in Australia and provide opportunities for new start-up companies, as well as potentially attracting biomedical industries from overseas to establish a presence in Australia. This exciting area of research will provide an excellent multidisciplinary research environment for the proposed ARC International Fellow. The new bio-inkjet printing equipment, materials and configurations developed here may also have impact on other areas of Bionics, including the development of the next generation Bionic Ear, conduits for spinal cord regeneration as well as for muscle regeneration.

Summary of Linkage International Fellowships Proposals

Victoria

Monash University

LX0989895 Prof YS Estrin; Dr RY Lapovok; Prof LS Toth

Approved Project Title **Modelling of Nanostructuring of Bulk Metallic Materials by Severe Plastic Deformation**

2009 : \$ 80,000

Primary RFCD 2913 METALLURGY

Collaborating Countries

France

Administering Organisation Monash University

Project Summary

The use of ultrafine grained alloys is expected to lead to significant breakthroughs in relation to fuel-efficient cars, light weight/high strength designs in aerospace and structural applications, and bio-medical implants. It will provide a wider market for such metals and create niche applications in domestic and export manufacturing industry. The development of technologically viable processes of nanostructuring hinges on the fundamental understanding of the fundamental mechanisms of microstructure and texture development. The knowledge base to be developed through this project will bring Australia to the international forefront in the area of structural nanomaterials and prepare the ground for future frontier technologies.

LX0989204 Dr J Nie; Prof Y Wang; Prof BC Muddle

Approved Project Title **Simulation and Modelling of Interactions between Dislocations and Precipitates in High Strength Light Alloys**

2009 : \$ 64,293

Primary RFCD 2913 METALLURGY

Collaborating Countries

USA

Administering Organisation Monash University

Project Summary

Most light alloys are strengthened by highly dispersed nanoscale precipitates. The mechanical behaviour of these alloys is determined by the intimate coupling between precipitate microstructure (size, shape and spatial distribution) and dislocation activities (by-pass, shearing and adsorption at interfaces). By integrating state-of-the-art experimental characterization and computer simulation techniques, this project aims to reveal detailed and accurate deformation mechanisms in these alloys. The knowledge gained and models developed are expected to provide guidelines to the optimization of existing alloys and design of new alloys, which is expected to create substantial wealth for Australia.

LX0989791 Prof RJ Summers; Dr DS Hutchinson; A/Prof T Bengtsson; Dr M Sato

Approved Project Title **Characterisation of insulin-independent glucose uptake mediated by guanine nucleotide-binding proteins (G-proteins) coupled receptors**

2009 : \$ 86,000

Primary RFCD 3005 VETERINARY SCIENCES

Collaborating Countries

Sweden

Administering Organisation Monash University

Project Summary

This project will provide first class postdoctoral training for Dr Sato in the laboratory of A/Prof Bengtsson one of the pioneers in the field of cell metabolism. He will learn new approaches to the study of cell signalling including the use of ribonucleic acid interference (RNAi) technologies and of a series of functionally altered mutants of phosphatidylinositol (PI) 3-kinase that he will bring back to Monash University. A better understanding of the cell signalling mechanisms involved in glucose transport will be of enormous benefit in developing new approaches to the treatment of diseases such as type II diabetes.

Summary of Linkage International Fellowships Proposals

LX0989907 Dr ID Svalbe; Dr N Normand

Approved Project Title **A new erasure resilient technique for encoding internet packets**

2009 : \$ 104,870

Primary RFC 2805 DATA FORMAT

Collaborating Countries

France

Administering Organisation Monash University

Project Summary

Efficient internet communication tolerates losing some packets sent across the web by sending a bit more information than is required. Any holes in the transmission can be repaired using the redundant data. We propose a new transmission protocol that is much simpler to encode and repairs broken messages faster. This new approach, based on sending data plus summed versions of itself, has generic applicability across all packet switched information networks.

Summary of Linkage International Fellowships Proposals

Swinburne University of Technology

LX0989623 Prof PD Drummond; Prof H Hu

Approved Project Title **Superfluidity in strongly correlated ultra-cold atomic Fermi gases**

2009 : \$ 98,570

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

Collaborating Countries

Canada

China

USA

Administering Organisation Swinburne University of Technology

Project Summary

Ultra-cold atoms are one of the most rapidly developing areas in twenty-first century physics. The scientific importance of studying strongly interacting Fermi gases is indicated by the fact that five Nobel prizes in physics were awarded in fields relevant to ultra-cold atoms in the last decade. Australia is now developing a reputation for world-class research in this new area, with new ultra-cold fermion experiments now underway in Melbourne. This project will build national and international cooperation in this field, provide world-class research training opportunities and advance Australia's leadership position. As well as improving scientific understanding, it has the potential to lead to new energy-saving technologies in the future.

LX0989973 Prof DA Forbes; Dr WE Harris

Approved Project Title **Near-field Cosmology with Globular Clusters**

2009 : \$ 78,590

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Collaborating Countries

Canada

USA

Administering Organisation Swinburne University of Technology

Project Summary

Globular star clusters are the astronomical equivalent of fossils, and as such they provide unique insight into the early epochs of the Universe. This project will establish a link between two world-leading research groups in this area. This Australian-Canadian collaboration will train the next generation of PhD students, create innovative 3D visualisation applications and produce a book on globular clusters.

LX0989763 Prof K Glazebrook; Prof RS Ellis; Dr GB Dalton

Approved Project Title **The Early History of Dark Energy**

2009 : \$ 58,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Collaborating Countries

Japan

UK

Administering Organisation Swinburne University of Technology

Project Summary

The national benefit will be the inclusion of Australian researchers (Glazebrook and his students/postdocs) in a major UK-Japanese international research project to study dark energy. This will be the successor to the highly successful WiggleZ project (on which Glazebrook is a designer and CI) using the much larger mirror of Subaru to push back the mapping of cosmic sound to much earlier epochs in the history of the Universe. Although Australia built parts of the FMOS instrument (under contract) there is currently no national right of access to any of the science surveys so it is only by developing these collaborations that we can capitalize on our innovative instrument design.

Summary of Linkage International Fellowships Proposals

LX0989834 Dr CJ Vale; Dr M Mark; Prof P Hannaford; Prof Dr R Grimm

Approved Project Title Fermionic superfluidity in lower dimensional quantum gases

2009 : \$ 90,000

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

Collaborating Countries

Austria

Administering Organisation Swinburne University of Technology

Project Summary

This project seeks to carry out cutting edge research on fermionic superfluidity using ultracold quantum gases. Through collaboration with one of the world's leading groups we will investigate the emerging issue of superfluidity in two-dimensional environments. This research will forge strong links with the European community and raise Australia's international profile in this rapidly growing field. Outstanding opportunities for young Australian scientists will arise through this collaboration and our findings may have implications for future superconducting technologies, based on the remarkable properties of fermionic superfluids.

Summary of Linkage International Fellowships Proposals

The University of Melbourne

LX0989942 Dr LA Connal; Dr CJ Hawker; A/Prof GG Qiao

Approved Project Title **Advanced nanoparticle stabilisation and functionalisation: small particles with huge potential**

2009 : \$ 86,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Collaborating Countries

USA

Administering Organisation The University of Melbourne

Project Summary

Australia is strongly investing in nanotechnology and through the governments priority goals 'Frontier Technologies for Building and Transforming Australian Industries' it has been recognised as an important area for investment. This proposal will help develop an internationally recognised nano-industry. It is envisaged that the particles made during this work will have direct implications for the public - creating a new class of medical diagnostic particles with better resolution and specificity. These particles have the potential to diagnose patients more precisely and at an earlier stage than is currently available. Additionally, these particles could be designed to load drugs and hence could be used to treat diseases such as cancer.

LX0990095 Prof PJ Forrester; Prof KE Bassler

Approved Project Title **Random matrix theory and high dimensional inference**

2009 : \$ 15,268

Primary RFCD 2301 MATHEMATICS

Collaborating Countries

USA

Administering Organisation The University of Melbourne

Project Summary

The topic of high dimensional inference and random matrix theory is one of present international prominence, as evidenced by the number of special programs on this theme of late. This is due both to recent advances in random matrix theory, and the fact that there are applications to areas such as econometrics, meteorology and engineering. With the CI being an expert in random matrix theory, and Professor Bassler an expert in complex systems, another line of applications will be emphasized, and a new axis of international linkage formed.

LX0989150 Prof RB Gasser; Prof PW Sternberg; Dr W Zhong

Approved Project Title **Automated, smart genomic data integration for the exploration of developmentally regulated molecules in parasites of major socioeconomic importance**

2009 : \$ 86,000

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 safe anti-parasite compounds/vaccines; (2) improved and sustainable control of key 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.

Summary of Linkage International Fellowships Proposals

Queensland

The University of Queensland

LX0990032 Dr SF Chenoweth; Dr HD Rundle; Mr TP Gosden

Approved Project Title **Adaptive evolution of mutual mate preferences in nature**

Project Title

2009 : \$ 81,000

Primary RFCD 2702 GENETICS

Collaborating Countries

Canada

Sweden

Administering Organisation The University of Queensland

Project Summary

Working at the interface of evolution, genetics and the environment, our research combines top scientists from Australia and abroad to seek a comprehensive understanding of the origins of biodiversity, and the evolution of new species. Such knowledge is essential if we wish to predict, and hopefully minimise, the loss of biodiversity through human-mediated environmental change. Using a native Australian insect, we are investigating the evolutionary consequences of the choice individuals make when selecting a mate. In addition to its role in the origin and maintenance of biodiversity, these choices can have fundamental effects on adaptation to changing environments and the long-term persistence of endangered populations.

LX0989320 Dr PM Grove; Prof Dr K Sakurai; Prof Y SUZUKI; Prof J Gyoba

Approved Project Title **Probing cross modal interactions in the perception of object motion and self-motion**

Project Title

2009 : \$ 50,000

Primary RFCD 3801 PSYCHOLOGY

Collaborating Countries

Japan

Administering Organisation The University of Queensland

Project Summary

How the brain integrates information from the different senses is not yet understood. This project aims first, to uncover how the brain integrates sound and visual information when perceiving moving objects and second, to probe more complex sensory interactions between sound, vision, and our vestibular senses when perceiving self-motion. This project will expand Australia's knowledge base, strengthen collaborative ties between Australia and Japan, and provide unique training opportunities for Australian and Japanese students. Publication of research in top-ranking journals will further promote Australian science abroad. Results will lead to improvements in the design of human-machine interfaces in both industry and entertainment.

LX0990031 Prof OV Lipp; Prof U Hess

Approved Project Title **Race and gender stereotypes on the brain: The case of emotion expression**

Project Title

2009 : \$ 56,000

Primary RFCD 3801 PSYCHOLOGY

Collaborating Countries

Canada

Administering Organisation The University of Queensland

Project Summary

Australia is a multicultural, multiethnic society in which people from different backgrounds interact every day. Successful interaction among persons from different backgrounds requires a mutual understanding of the manner in which emotions are expressed and perceived as emotions are a central part of any interaction. The current project will investigate whether there are systematic biases in the manner in which emotions are expressed and perceived within and across ethnic groups. It will rely on objective indices to achieve this aim, measures of the electrical activity of the brain.

Summary of Linkage International Fellowships Proposals

LX0990082 Dr DS Morrison; Prof RM Lawless

Approved Project Title **A Consumer Bankruptcy Project - an interdisciplinary empiric inquiry into determinants and impacts of bankruptcy upon Australian debtors**

2009 : \$ 32,000

Primary RFCD 3901 LAW

Collaborating Countries

USA

Administering Organisation The University of Queensland

Project Summary

The research will enhance the wellbeing of Australian society by obtaining a better understanding of the profile of bankrupt debtors, the reasons for personal default and the impact of the regulatory framework upon all stakeholders. It will draw parallels with US trends and apply an interdisciplinary empiric method to Australian personal insolvency data. The research will lead to an informed debate around critical wider issues such as financial literacy, managing money and self-funded retirement that impact upon the physical and material health of all Australians. The project promotes the reduction of financial distress and dependence in assisting efforts to shift the risk of economic burden of an ageing population from the Commonwealth.

LX0989423 Dr H Xing; Prof H Zhang; Prof HB Muhlhaus; Prof H Gurgenci; Dr D Wyborn

Approved Project Title **Supercomputer Simulation of Multiscale Dynamic Behaviour in Multiphase Deformable Porous Media**

2009 : \$ 107,230

Primary RFCD 2802 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

Collaborating Countries

China

Administering Organisation The University of Queensland

Project Summary

This project will establish and consolidate links between leading groups in China and Australia to develop a new and unique multiscale computational model and algorithm for simulating multiphase nonlinear behaviours of the porous media under dynamic loading conditions, and improve technology transfer between the two groups by the mobility of the ARC International Fellow. This will aid Australian geoscience and mining industry, such as in HFR geothermal/UCG energy facility design, construction, risk assessment and production and could help Australia shift away from greenhouse gases and become a world leader in the emerging worldwide HFR geothermal/UCG industry.

LX0989851 A/Prof J Zhao; Prof AR Chivas; Dr H Zhou

Approved Project Title **Continental temperature and rainfall change during past global warming - a multiproxy approach involving clumped isotopes in speleothems**

2009 : \$ 82,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Collaborating Countries

China

Administering Organisation The University of Queensland

Project Summary

Global climate simulation and prediction models depend on accurate and quantitative measurements of key climatic parameters such as temperature and rainfall, and their temporal changes and spatial distributions. Our research will combine the revolutionary clumped isotope thermometry with other climatic proxies archived in stalagmites to quantify temperature and rainfall changes in Australia and China during the past two major episodes of global warming (Terminations I and II). This pilot project directly addresses national research priority goals 'Water - a critical resource', 'Responding to climate change and variability', provide an excellent platform for cross-institutional research training and enhance scientific exchange with China.

Summary of Linkage International Fellowships Proposals

LX0990027 Prof J Zhu; A/Prof F Li

Approved Project Title **Theoretical Study of Functionalized Boron Nitride Nanotubes and Their Application as Gas Sensor**

2009 : \$ 62,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Collaborating Countries

China

Administering Organisation The University of Queensland

Project Summary

The gas sensors to be studied in this project can be deployed for a variety of applications, such as environmental monitoring, sensing in chemical processing plant, and gas detection for counter-terrorism, this project thus can significantly contribute to environmental protection, national security, and agriculture and pharmaceutical industries in Australia. Such mechanism understanding will also be very useful for exploring the applications of BNNTs in nano-optical-magnetic devices, energy storage and biomaterials. This project will also be important for keeping Australia in the frontier area in the research areas of nanotubes.

Summary of Linkage International Fellowships Proposals

South Australia

The Flinders University of South Australia

LX0989444 A/Prof NH Voelcker; Asst Prof PF Teran Arce; A/Prof JG Shapter; Prof R Lal; Dr D Losic; Dr F Cunin; Prof F Sanz

Approved Project Title **Combining the soft with the hard: The assembly of artificial cell membranes on porous semiconductors**

2009 : \$ 110,000

Primary RFCD 2504 ANALYTICAL CHEMISTRY

Collaborating Countries

France

Spain

USA

Administering Organisation The Flinders University of South Australia

Project Summary

The platform technologies developed in this project will have a wide range of applications. They will reveal new insights into drug-membrane and drug-protein interactions underpinning development of a new generation of drugs acting on transmembrane proteins that are linked to a wide range of diseases. The development of membrane-based biosensing devices targeting ion channels, membrane active peptides or toxins which can be applied to biomedical diagnostics, biotoxin detection, environmental and food control will be readily achievable. This international interdisciplinary nanobiotechnology programme and its outcomes will enhance Australia's abilities in frontier technologies and build research strength in nanobiotechnology.

Summary of Linkage International Fellowships Proposals

Western Australia

Curtin University of Technology

LX0989220 Prof Dr WE Featherstone; Em/Prof P Vanicek

Approved **Validation of Synthetic Regional Gravity Field Models**

Project Title

2009 : \$ 54,000

Primary RFCD 2910 GEOMATIC ENGINEERING

Collaborating Countries

Canada

Estonia

Administering Organisation Curtin University of Technology

Project Summary

This research will further develop the theoretical and practical methods required to test any model of the Earth's gravity field. Previously, geodesists have had to rely on analytical error estimates, usually based on observed data. A synthetic Earth gravity model avoids this scenario by giving an exact validation technique of the methods used. The synthetic model will allow users of geoid models (e.g., for GPS heighting) to have much more confidence in their results. When used with a precise geoid model, GPS is faster and cheaper than conventional spirit-levelling, offering around 800% productivity gains.

Summary of Linkage International Fellowships Proposals

Tasmania

University of Tasmania

LX0989775 Dr J Wright; Dr AS Freeman; Dr CL Hewitt; Asst Prof M Campbell

Approved Project Title **Post-invasion trait-mediated indirect interactions: ecological and evolutionary impacts of the invasive European green crab**

2009 : \$ 60,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Collaborating Countries

USA

Administering Organisation University of Tasmania

Project Summary

A multitude of ecological interactions determine the success and impacts of invasive species. We will advance current knowledge of the impacts of invasive European green crabs in Australia by detailing ecological and evolutionary interactions with native molluscs. This information will be useful in understanding the crab's invasion success and impacts on native communities in Australia and other regions invaded by the crab worldwide. More broadly, this work will provide an evolutionary perspective of post-invasion processes that has been substantiated in terrestrial systems but is often lacking in marine systems.

Australian Capital Territory

The Australian National University

LX0989627 Prof VV Bazhanov; Em/Prof RJ Baxter; Dr JH Perk; Dr H Au-Yang; Prof BM McCoy

Approved **New frontiers in statistical mechanics**

Project Title

2009 : \$ 82,090

Primary RFCD 2301 MATHEMATICS

Collaborating Countries

USA

Administering Organisation The Australian National University

Project Summary

The chiral Potts model has been introduced in 1981 as a model for commensurate-incommensurate phase transitions in a layer of atoms or molecules adsorbed to a solid surface. If the adsorbed atoms all fit to holes between the surface atoms, the added layer is frozen, commensurate with the surface. If the added atoms are unable to fit holes, the added layer is no longer commensurate with the surface and could be in a floating state. A deeper understanding of this and similar phenomena in layered systems has nanotechnological implications. This may affect the design of new small electronic devices or could apply to small biological systems and the development of new medicines. The project will surely lead to new applicable mathematics.

LX0989874 Prof MS Bessell; Prof JW Liebert; Prof BP Schmidt; Prof KC Freeman; Prof DT Wickramasinghe; Dr L Ferrario

Approved **The White Dwarf Luminosity Function and the History of Star Formation in the Galaxy**

Project Title

2009 : \$ 86,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Collaborating Countries

USA

Administering Organisation The Australian National University

Project Summary

The numbers of white dwarfs at different brightnesses and colours maps out a continuous record of the star formation history of the Milky Way. Our program seeks to unravel that history using white dwarfs discovered with the SkyMapper Survey and thereby understand how our Milky Way galaxy and other galaxies evolved the form and mixture of sub-structures that we see today. These results will be widely disseminated stimulating interest in the natural sciences amongst the general public and the nation's youth. We will train young researchers in cutting edge science, enhancing skills in data analysis, stellar atmosphere and interior computations and problem solving.

LX0989686 Dr AA Sukhorukov; Prof Dr AV Lavrinenko

Approved **Slow-light photonics**

Project Title

2009 : \$ 49,000

Primary RFCD 2404 OPTICAL PHYSICS

Collaborating Countries

Denmark

Administering Organisation The Australian National University

Project Summary

This project will introduce and demonstrate novel concepts for the manipulation of optical signals in ultra-compact photonics devices, making an essential step towards fast all-optical switching and processing of data streams. These developments underpin the next generation of high-performance networks, promising to revolutionize global communications. This project will keep Australia at the forefront of international research and provide training of students on breakthrough applications of photonics and nanotechnology, contributing to the uptake of frontier technologies by Australian industries for successful operation in a competitive global environment.