

Summary of Discovery Projects Proposals for Funding to Commence in 2010

Victoria

Swinburne University of Technology

DP1095103 A/Prof LL Andrew; A/Prof H Vu

Approved Project Title **Mechanism design for next generation random access wireless protocols**

2010 : \$ 50,000

2011 : \$ 50,000

2012 : \$ 50,000

Primary RFCD 2302 STATISTICS

Administering Organisation Swinburne University of Technology

Project Summary

Australia is well placed to take the lead in replacing carbon-intensive travel by teleconferencing, because of its isolation and geographic dispersion. Because these large distances introduce inevitable delays, it is important that the network itself add as little delay as possible for such real-time services. Our novel and practical resource allocation scheme will enable Australians (including Australian industries and rural communities) to receive better service at lower cost. This project will put Australia on the international stage as a leading contributor to wireless Internet technology. We will provide training for PhD students and postdoctoral fellows in this important area.

DP1093517 Prof AV Babanin; Prof WR Phillips; Dr A Ganopolski

Approved Project Title **Wave-Induced Upper-Ocean Mixing**

2010 : \$ 110,000

2011 : \$ 100,000

2012 : \$ 100,000

Primary RFCD 2912 MARITIME ENGINEERING

Administering Organisation Swinburne University of Technology

Project Summary

The wave-induced mixing is of principal importance for air-sea interaction models since heat capacity of 2-3m of the ocean water is equal to the capacity of the entire atmosphere. This project will study and implement such mixing, including the newly described physical phenomenon of wave-induced turbulence, into a variety of models. As a result, wave models and global climate models will be coupled. It is believed that such coupling will enhance our ability to predict the impact of global climate change. As part of the project, predictions of changes to the global wave climate will be developed. Such predictions are important to a nation such as Australia where significant population and economic assets are located close to the coast.

DP1093738 Prof WJ Couch; Prof K Glazebrook; Dr CA Blake; Prof MJ Drinkwater; Dr DJ Croton; Dr KA Pimblet; Prof M Colless; Dr DC Martin; Dr TK Wyder

Approved Project Title **The fundamental physics governing the formation of cosmic structure**

2010 : \$ 200,000

2011 : \$ 180,000

2012 : \$ 180,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Organisation Swinburne University of Technology

Project Summary

This project will investigate the physics that underlie three of the most fundamental processes within the universe - its accelerated expansion, the formation of cosmic structure, and galaxy formation - thereby contributing to the Priority Goal of Breakthrough Science under National Research Priority 3. It will involve world-leading research in these areas, enabled by innovative instrumentation on Australia's national telescope facilities. National benefit will also come via the collaborations it will involve with prestigious North American institutions. These collaborations will lead to new research capability being built within Australia, through knowledge and expertise being vested in young postgraduate and postdoctoral researchers.

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DP1095506 Dr DJ Croton

Approved Project Title **A theoretical understanding of galaxy assembly and black hole evolution across cosmic time**

2010 : \$ 130,000
2011 : \$ 150,000
2012 : \$ 175,000
2013 : \$ 140,000
2014 : \$ 130,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES
QEII Dr DJ Croton

Administering Organisation Swinburne University of Technology

Project Summary

This research will establish Australia as a centre for cutting edge galaxy formation modelling. To achieve its science goals, we will make publicly available the world's largest cosmological simulation of dark matter and galaxy evolution. We will design and deploy an online web portal within which custom galaxy formation models can be constructed by anyone in the community for their own work. Support for this proposal will strengthen theoretical astronomy in Australia at a time when increased theoretical infrastructure is needed to fully capitalise on Australia's significant observational investments.

DP1095061 Prof DJ Given; Prof RE Collins

Approved Project Title **Imperial Designs: Remaking the Institutions of Global Communications**

2010 : \$ 50,000
2011 : \$ 50,000
2012 : \$ 41,000

Primary RFCD 4001 JOURNALISM, COMMUNICATION AND MEDIA

Administering Organisation Swinburne University of Technology

Project Summary

Fresh perspectives about markets, hierarchies and networks as ways of organising economic activity will come from better understanding the governance and performance of Australia's overseas communications in the second half of the 20th century. In the internet era, when so much online activity involves overseas access, global links are even more important to the cultural and economic innovation sought through improved broadband infrastructure. Answering the recent call for 'a wide-ranging reassessment of Australia's imperial experience across a broad front', research about the post-war Commonwealth telecommunications scheme will be particularly valuable as the global financial crisis tests forms of globalization that seemed durable.

DP1094370 Prof K Glazebrook; Prof RG Abraham; Dr PJ McCarthy

Approved Project Title **Mass assembly and galaxy evolution: measuring origins in deep time**

2010 : \$ 110,000
2011 : \$ 105,000
2012 : \$ 115,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Organisation Swinburne University of Technology

Project Summary

This proposal will allow an Australian group to take an international leading role in the studies of galaxy assembly in the early Universe using the world's largest telescopes to make critical advances in this fundamental unsolved problem. The images obtained of the dawn of galaxies will be four times clearer than those from the Hubble Space Telescope. Young researchers will be trained in using laser Adaptive Optics which will be a key technology for making the next generation of discoveries with future Extremely Large Telescopes. Our new understanding of the matter content of the early Universe (especially cold hydrogen gas) will also be vital for planning and using the future giant radio telescopes to be built in Western Australia.

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DP1095600 Dr EV Ryan-Weber
Approved Project Title **The Intergalactic Medium: from cosmic dawn to the local web**
2010 : \$ 150,000
2011 : \$ 150,000
2012 : \$ 150,000
2013 : \$ 120,000
2014 : \$ 119,594
Primary RFCD 2401 ASTRONOMICAL SCIENCES
QEII Dr EV Ryan-Weber
Administering Organisation Swinburne University of Technology

Project Summary

The search for elements in the early Universe places Australian astronomers at the forefront of challenging observational work enabling us to address fundamental astrophysical questions. Our preparation and research with the Australian Square Kilometre Array Pathfinder (ASKAP) will secure Australia as a world leader in radio astronomy. Two PhD students will be trained as a part of this grant, their skills will be invaluable to the future of Australian research, and will transfer directly to information and communications technology.

DP1093834 Prof A Scholey; Prof CK Stough
Approved Project Title **Glucose facilitation of cognitive function: Effects of effort, age and glucose control**
2010 : \$ 62,000
2011 : \$ 48,000
2012 : \$ 55,000
Primary RFCD 3801 PSYCHOLOGY
Administering Organisation Swinburne University of Technology

Project Summary

Age-related decline in mental capacity contributes to the economic (estimated at over 2 trillion AUD by 2050), social and human costs of an increasingly older Australian population. The studies in this program aim to understand the role of poor control of blood glucose in age-related cognitive deficits. The role of individual differences in biological (hormonal responses) and psychological (stress and appetite) factors will also be assessed. A better understanding of the nature of age-related cognitive decline as it relates to biological processes such as blood glucose control will help to develop tangible strategies to combat age-related cognitive decline and dementia (which has been described as Type 3 diabetes).

DP1093825 Prof CK Stough; Prof A Scholey; Prof KD Croft
Approved Project Title **Improving cognitive function in the elderly**
2010 : \$ 90,000
2011 : \$ 108,000
2012 : \$ 90,000
Primary RFCD 3801 PSYCHOLOGY
Administering Organisation Swinburne University of Technology

Project Summary

The ageing population has been identified as one of the major issues facing contemporary Australian society. For Australia, human ageing has significant societal, economic and, importantly, personal/human costs. The economic costs associated with ageing reflect decreased productivity as well as a higher incidence of a variety of illnesses including cardiovascular and respiratory disease and, importantly, neurological conditions such as Parkinson's disease (PD) and Alzheimer's disease (AD). We will complete two large scale studies examining the efficacy of twelve months administration of two pharmacologically active supplements in reducing the cognitive effects of aging in elderly participants.

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DP1096753 Prof JL Wilson; A/Prof NT Lam

Approved Project Title **Displacement Controlled Behaviour of Non-ductile Structural Walls in Regions of Lower Seismicity**

2010 : \$ 60,000
2011 : \$ 60,000
2012 : \$ 60,000

Primary RFCD 2908 CIVIL ENGINEERING

Administering Organisation Swinburne University of Technology

Project Summary

Buildings supported by non-ductile structural walls investigated in this research represents the great majority of building stock in Australia, in both the commercial and high-density residential sectors and buildings occupied by organisations with a post-disaster function such as hospitals and emergency services. The outcomes from the research will be of direct benefit to the insurance industry, owners of building stock, emergency planning organisations, building code committees and policy makers involved in risk reduction strategies.

DP1093349 Prof IR Young; Prof AV Babanin; Prof MA Stiassnie; Dr DJ Greenslade

Approved Project Title **Numerical Modelling of Extreme Waves Generated by Tropical Cyclones**

2010 : \$ 110,000
2011 : \$ 100,000
2012 : \$ 105,000

Primary RFCD 2912 MARITIME ENGINEERING

Administering Organisation Swinburne University of Technology

Project Summary

Waves generated by tropical cyclones are a key design parameter for shipping, coastal and offshore structures and coastal erosion. The accurate prediction of tropical cyclone generated extreme waves is consequently of critical importance. Outcomes of the project will lead to more accurate wave forecasts, both for tropical cyclones and other extreme events. The main result will be a new non-linear approach to be used in prediction models. This approach is expected to be broadly implemented by the meteorological, oceanographic and scientific communities around the world and potentially replace existing algorithms in spectral wave models. The economic and social implications of an enhanced ability to predict such extremes are significant.