

Summary of Discovery Projects Applications for Funding to Commence in 2006

Victoria

Swinburne University of Technology

DP0665401 Mr Z Bomzon

Approved Project Title **A biophotonics-based approach to the study of cell-mechanics**

2006 : \$92,000

2007 : \$85,000

2008 : \$85,000

Primary RFCD 2499 OTHER PHYSICAL SCIENCES

APD Mr Z Bomzon

Administering Institution Swinburne University of Technology

Project Summary

This study will help to promote and maintain good health. There is a connection between diseases such as arthritis and osteoporosis and cell mechanics. Our study will provide insight into cell mechanics, thereby helping to understand the pathophysiology of these diseases. The study is relevant to tissue engineering. There is ongoing research on mechanical conditioning of tissue substitutes. Understanding cell mechanics will help to optimise conditioning protocols, thereby improving the properties of engineered tissue.

During this study we will develop optical tools that have applications in the life sciences, in the development of advanced materials and in nanotechnology. Our project will promote Australian research in these fields.

DP0665574 Prof BK Gibson; Prof Sir MJ Rees; Prof G Efstathiou; Prof J Silk; Dr GF Lewis; Dr RS Sutherland; Dr D Kawata; Dr CJ Fluke

Approved Project Title **The Commonwealth Cosmology Initiative: From the First Objects to the Cosmic Web**

2006 : \$174,000

2007 : \$176,000

2008 : \$182,000

2009 : \$91,000

2010 : \$117,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Institution Swinburne University of Technology

Project Summary

The Commonwealth Cosmology Initiative (CCI) is an exciting development for Australian astronomy's gifted young High Performance Computational (HPC) Astrophysics community. The CCI links the efforts of Australia's next-generation of HPC and theoretical cosmologists with those of the leading scientists in the world. The CCI will provide unparalleled opportunities to Australia's postgraduate and Early Career Researcher community to take part in a program of research designed to answer several of the fundamental mysteries of modern astronomy - the formation of galaxies, their relationship with Cosmic Web in which they are embedded, and the nature of dark matter.

DP0664412 Dr R Hassan

Approved Project Title **Speed, Time and the Political Process in Australia**

2006 : \$93,240

2007 : \$93,240

2008 : \$93,240

2009 : \$93,240

2010 : \$93,240

Primary RFCD 3701 SOCIOLOGY

ARF Dr R Hassan

Administering Institution Swinburne University of Technology

Project Summary

The project represents the first empirically-based study to research the traditional processes of political decision-making from the perspective of time and speed in the context of economic globalisation and the networked society. A clearer understanding of how political processes function in a globally-networked setting will provide valuable insight into how well the fundamental, politically grounded, aspects of Australian life and culture are functioning. This unique perspective will form the basis of an incisive method of applying 'time-awareness' not only to the political process, but to the many national/community sectors across Australian society that depend upon responsible and effective decision-making practices.

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DP0664105 Dr Al Karakas

Approved Project Title **Nucleosynthesis of low and intermediate mass stars: A study into the origin of the elements**

2006 : \$84,000

2007 : \$74,340

2008 : \$74,340

Primary RFCD 2401 ASTRONOMICAL SCIENCES

APD Dr Al Karakas

Administering Institution Swinburne University of Technology

Project Summary

Everything in our Solar System, including the Sun and all life on Earth, were created out of material forged long ago in fiery stellar furnaces. In the hot dense cores of long dead stars the material most vital to life was created. However, the stellar origin of many elements is unknown although we can make guesses, from observations of stars and by bringing together ideas from different scientific fields including astrophysics, nuclear physics and geochemistry. Using the latest theoretical techniques together with the most recent experimental data, it is possible to piece together the clues to unravel the mystery of the origin of the elements.

DP0663076 Dr K Neumann

Approved Project Title **Australian Public Policy Responses to Refugees and Asylum Seekers: Comparativist and Historical Perspectives**

2006 : \$80,000

2007 : \$35,000

Primary RFCD 4301 HISTORICAL STUDIES

Administering Institution Swinburne University of Technology

Project Summary

Furnishing the first comprehensive history of Australia's response to refugees and asylum seekers, the project will enhance our understanding of the genealogy of current Australian policy and inform debate in an area of intense concern to policy makers and the general public. The project will put the Australian response into context by comparing it with that of New Zealand and by analysing it against the backdrop of the evolution of the international refugee regime.

DP0666288 Prof DV Nicolau; Dr PD Sawant; Dr IL Medintz

Approved Project Title **Biomolecular activity modulated by interaction with nanostructures**

2006 : \$200,000

2007 : \$150,000

2008 : \$150,000

Primary RFCD 2918 INTERDISCIPLINARY ENGINEERING

Administering Institution Swinburne University of Technology

Project Summary

Nanotechnological methods are able to reliably fabricate artificial nanostructures with dimensions similar to those of large biomolecules (a few to tens of nanometers). This study focuses on the interaction of artificial nanostructures with biomolecules such as proteins and DNA, and will enable scientists to better understand biomolecular recognition and binding events, which are central to all biological processes. The understanding gained can then be used to design biomimetic surfaces for use in health monitoring and medical diagnostic devices with improved sensitivity, robustness and portability, thereby providing significant benefits to the health sector.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663152 Dr J Serbin

Approved Project Title **Fabrication of complete photonic band gap structures by two-photon polymerization and subsequent infiltration with high refractive index materials**

2006 : \$74,340

2007 : \$74,340

2008 : \$74,340

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr J Serbin

Administering Institution Swinburne University of Technology

Project Summary

The ability to shrink photonic circuits by orders of magnitudes by the integration of photonic crystals offers many stimulating possibilities for novel device designs. A speculative view is that this miniaturisation can have a similar impact to that experienced in electronic components in the 1960s. However, the fabrication of 3D photonic crystals remains a major challenge and the development of new, flexible, and fast nano-fabrication techniques is vital. The realization of an innovative technique for the fabrication of 3D complete photonic band gap structures as it is suggested will make an essential contribution to the emerging field of all-optical tele- and data-communications and will deliver major economic benefit to Australia.

DP0663722 Dr SJ Tingay; Dr A Tzioumis; Dr K Haines; Prof S Gulyaev; Dr TJ Cornwell; Dr DL Jauncey

Approved Project Title **A deep survey for compact structure in the nearby universe: key science for the upgraded Australian Long Baseline Array**

2006 : \$90,000

2007 : \$87,000

2008 : \$91,000

Primary RFCD 2401 ASTRONOMICAL SCIENCES

Administering Institution Swinburne University of Technology

Project Summary

This project uses advances in ICT to build a national and international network of facilities that includes existing telescopes primarily on the east coast of Australia, as well as planned facilities in Western Australia and New Zealand. One of these facilities, the New Technology Demonstrator, is a crucial part of Australia's roadmap to the Square Kilometre Array. The SKA-related science and technology demonstrations we will undertake as part of this project will contribute to Australia's bid to host this \$US1b instrument. This project cements a significant Trans-Tasman collaboration and brings together researchers in astrophysics and ICT to give Australia a leading position in the field of eVLBI.

DP0663759 A/Prof BD Todd; A/Prof PJ Daivis

Approved Project Title **Computational Nanofluidics**

2006 : \$79,564

2007 : \$85,006

2008 : \$95,000

Primary RFCD 2506 THEORETICAL AND COMPUTATIONAL CHEMISTRY

Administering Institution Swinburne University of Technology

Project Summary

This project will generate an increased level of skill and expertise in Australia in the emerging science of nanotechnology. To realise the promise of nanotechnology, a means of controlled propulsion on the nano scale is vital. A deeper understanding of nanofluidics that allows greater predictive capacities can greatly aid this realisation. It is highly likely that computational nanofluidics will play as important a role in nanotechnology based industries as computational fluid dynamics (CFD) currently plays in today's manufacturing, automotive and aerospace industries. The skills and knowledge gained from this project will enhance our international competitiveness in this area.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663841 Prof Y Yang; Prof R Kowalczyk; Dr J Yan

Approved Project Title **Agent-based coordination and negotiation technologies for decentralised service workflow management**

2006 : \$85,000

2007 : \$74,340

2008 : \$74,340

Primary RFCD 2803 COMPUTER SOFTWARE

APD Dr J Yan

Administering Institution Swinburne University of Technology

Project Summary

This project will enhance the nation's expertise in ICT in general and smart information use in particular. In the real world, process management is a key issue in any workplace organisation which needs to be supported by workflow systems, particularly in this Internet and Web services era. This project will develop an innovative framework and the corresponding technologies for service workflow management. The research will assist many organisations to effectively develop and deliver more efficient, reliable, flexible and adaptive business applications. Consequently, this will enhance the ability of many Australian organisations to run more productively and more competitively.

DP0665868 Dr G Zhou

Approved Project Title **Nonlinear photonic crystal fabrication in a high refractive index lithium niobate crystal**

2006 : \$74,340

2007 : \$74,340

2008 : \$74,340

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr G Zhou

Administering Institution Swinburne University of Technology

Project Summary

The method proposed in this project is a very promising and versatile method to achieve 3D nonlinear PhCs in a high refractive index material. This project will expand the national knowledge in the area of nonlinear PhCs. The successful compensation of the spherical aberration will advance the optical microfabrication technique. It is expected that the project will provide many chances for postgraduate students to become involved. Some newly developed devices based on nonlinear PhCs may find their commercial applications and we have a chance of securing the intellectual property related to these applications. In a long term, nonlinear PCs may be widely used in daily life and provide some opportunities to the industries.