

Linkage CSIRO – Projects Supported

Project: LC0348248 Forbes, D

Swinburne University of Technology
The Evolution of Gas in Galaxy Groups

Investigator(s)

1	CIU	A/Prof DA Forbes	Swinburne University of Technology
2	CIC	Dr B Koribalski	CSIRO - Australia Telescope National Facility
3	APDC	Dr VA Kilborn	University of Manchester
4	CIC	Dr SJ Tingay	CSIRO - Australia Telescope National Facility
5	CIU	Prof BK Gibson	Swinburne University of Technology
6	CIU	Prof KC Freeman	The Australian National University

Abstract

The evolution of gas in galaxy groups is poorly understood, but is crucial to understanding galaxy evolution. This project provides a training opportunity for a talented postdoc to conduct the first 'multiwavelength census' of southern galaxy groups, perform simulations and make predictions of group properties at early times. We will better understand the evolutionary processes in groups and provide a 'local anchor' for future surveys. The knowledge gained will feed directly into the design of the future Square Kilometre Array, and raise Australia's profile in this \$1B project. We exploit Australia's best astronomical facilities, and establish a new University-CSIRO collaboration.

Allocations	Count:	Total	2003	2004	2005
Dr VA Kilborn	APDC	3	\$193,035	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345

Project: LC0348317 Davidson, M

The University of Melbourne
DROP DEFORMATION IN CONFINED MICROFLUIDIC GEOMETRIES

Investigator(s)

1	CIU	A/Prof MR	The University of Melbourne
2	CIC	Dr M Rudman	CSIRO - Manufacturing and Infrastructure Technology
3	CIU	Dr JJ Cooper-White	The University of Melbourne
4	APDC	Dr DJ Harvie	University of Alberta

Abstract

Increasingly, high technology applications in biotechnology and microtechnology industries need to process complex (non-Newtonian) fluids with dispersed particles/droplets in channels as small as several microns (microfluidics). A computational fluid dynamic model of non-Newtonian droplet deformation in microfluidic geometries will be developed, and validated using experimental measurements of the flow field in this project. The aim is to understand and quantify factors influencing droplet deformation. Coupling non-Newtonian characteristics with microfluidic geometries will allow the continuous manufacture of micro-particles of specified size and shape for existing and new applications, and will provide guidance for further extending the process to nano-particle manufacture.

Allocations	Count:	Total	2003	2004	2005
Dr DJ Harvie	APDC	3	\$193,035	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345

Project: LC0348353 Burton, M

The University of New South Wales
Star Formation at Millimetre Wavelengths with the CSIRO Australia Telescope

Investigator(s)

1	CIU	A/Prof MG Burton	The University of New South Wales
2	CIC	Prof RP Norris	CSIRO - Australia Telescope National Facility
3	APDC	Dr TH Wong	CSIRO - Australia Telescope National Facility

Abstract

The newly-upgraded CSIRO Australia Telescope Compact Array, together with the CSIRO Mopra Telescope, provide a unique and powerful combination for studying the millimetre-wave emission from molecules and cold dust in star formation regions. We propose to combine the astrophysical expertise of UNSW with the instrumental expertise of CSIRO to use these instruments to study the processes of star formation. There are two parallel themes to this research: to commission and develop optimal techniques for using the new instruments, and to make use of them to explore the poorly-understood processes that cause stars to form.

Allocations	Count:	Total	2003	2004	2005
Dr TH Wong	APDC	3	\$193,035	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345

Project: LC0348504 England, M

The University of New South Wales

Quantifying the role of the Southern Ocean for anthropogenic CO2 uptake

Investigator(s)

1	CIU	Dr MH England	The University of New South Wales
2	APDC	Dr BI McNeil	Princeton University
3	CIC	Dr RJ Matear	CSIRO - Marine Research

Abstract

Carbon dioxide (CO2) is the most important greenhouse gas contributing to global warming and climate change. Climate change is likely to have dramatic economic and environmental consequences for Australia. Knowledge and understanding of the complex carbon cycle is fundamental for predicting future atmospheric CO2 levels and managing climate change. The aim of the work proposed here is to quantify and improve our understanding of the oceans role in controlling atmospheric CO2 levels. This will be done by combining modeling and observational expertise among UNSW and CSIRO (Marine Research) researchers. Our work will be the first to assess the extent of which the Southern Ocean (and Australian waters) acts as a carbon sink. This will reduce modeling uncertainties in predicting future atmospheric CO2 levels and will also be valuable to the federal government in future international negotiations on climate change.

Allocations

		Count:	Total	2003	2004	2005
Dr BI McNeil	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348524 Batterham, P

The University of Melbourne

The Cytochrome P450 Gene Super-family in Drosophila melanogaster; Gene Function and Insecticide Resistance

Investigator(s)

1	CIU	Dr P Batterham	The University of Melbourne
2	CIC	Dr JG Oakeshott	CSIRO - Entomology
3	APDC	Dr PJ Daborn	University of Bath

Abstract

The cytochrome P450 (Cyp) gene super-family is represented by over 90 sequences in the genome of the vinegar fly, Drosophila melanogaster. To date, four Cyp genes are found to be involved in insecticide resistance. The function of the majority of Cyp genes is unknown. This project will investigate the function and regulation of D. melanogaster Cyp genes, linking the fly's genotype to its phenotype. By studying the effects of Cyp genes on fly survival, Cyp gene expression and regulation, and expressing selected Cyp genes in a yeast expression system, we will enhance our understanding of Cyp gene function and evolution.

Allocations

		Count:	Total	2003	2004	2005
Dr PJ Daborn	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348576 Dixon, N

The Australian National University

Subunit Contacts in a Replicative DNA Polymerase: A New Paradigm for Protein-Protein Interactions?

Investigator(s)

1	CIU	Dr NE Dixon	The Australian National University
2	CIC	Dr G Wijffels	CSIRO - Livestock Industries
3	CIU	Prof G Otting	The Australian National University
4	APDC	Dr K Ozawa	The Australian National University

Abstract

The bacterial DNA polymerase III is a 15-subunit protein that acts as an extraordinary molecular machine to copy both strands of chromosomal DNA at the same time, making DNA at the rate of 1000 base pairs each second without ever falling off the chromosome or making mistakes. This project aims to understand the way its subunits interact, such that they can form stable complexes that are nevertheless flexible enough to accomplish DNA synthesis. There are applications of this knowledge to discovery of new antibacterial agents and in design of new protein machines.

Allocations

		Count:	Total	2003	2004	2005
Dr K Ozawa	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348594 Craik, D

The University of Queensland
Development of Novel Pesticidal Agents

Investigator(s)

1	CIU	Prof DJ Craik	The University of Queensland
2	CIC	Dr K Kongsuwan	CSIRO - Livestock Industries
3	CIU	Dr MA Anderson	La Trobe University
4	APDC	Dr ML Colgrave	The University of Queensland

Abstract

We have discovered a family of naturally occurring plant proteins called the cyclotides that have potent insecticidal activity against *Helicoverpa* species, one of the major pests on cotton and corn in Australia and world wide. Preliminary evidence has shown that they also have activity against major pests to livestock in Australia, including sheep blowflies. To develop these proteins as potential pesticidal agents it is necessary to understand the structural basis for their activity. We will do this by chemically synthesising peptides with selected residues mutated to determine their

Allocations		Count:	Total	2003	2004	2005
Dr ML Colgrave	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348615 Esselle, K

Macquarie University
Photonic Crystal Signal Processing and Antenna Technologies

Investigator(s)

1	CIU	Dr KP Esselle	Macquarie University
2	CIC	Dr TS Bird	CSIRO - Telecommunications & Industrial
3	CIU	Prof BC Sanders	Macquarie University
4	APDC	Dr AR Weily	Macquarie University

Abstract

The information society in which we live requires increasingly high bandwidth, low cost communications. This project addresses two critically important technologies needed to meet these demands: signal processing devices and antennas. These devices will be designed using three-dimensional photonic crystals, which provide excellent possibilities for low-cost, highly integrated photonic circuits. Working prototypes will be built at microwave frequencies, but due to the scalability of electromagnetic theory these results are also valid in the optical domain. The outcomes of this project will be accurate theoretical models and empirical tests for new technologies that satisfy the future needs of the information

Allocations		Count:	Total	2003	2004	2005
Dr AR Weily	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348657 Yu, A

The University of New South Wales
Fundamental studies of the packing and compaction of fine particles

Investigator(s)

1	CIU	Prof AB Yu	The University of New South Wales
2	CIC	Dr SX Choi	CSIRO - Petroleum Resources
3	APDC	Dr R Yang	The University of New South Wales

Abstract

This project will investigate the fundamentals of the packing and compaction of fine particles at both microscopic and macroscopic levels through a combined theoretical and experimental program. It involves the use of advanced techniques to generate particle scale information, so that a packing and compaction process can be assessed at various time and length scales. It will produce a comprehensive understanding of the underlying physics, computer models capable of predicting the micromechanics and transport properties of porous media, and an effective means to solve many packing and compaction problems widely encountered in minerals and materials processing industries.

Allocations		Count:	Total	2003	2004	2005
Dr R Yang	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345

Project: LC0348689 Soria, J

Monash University

Atomisation and Combustion Physics of Australian Bio-oils

Investigator(s)

1	CIU	Prof J Soria	Monash University
2	CIC	Dr P Fung	CSIRO - Forestry & Forest Products
3	CIU	Dr DR Honnery	Monash University
4	APDC	Dr V Stamatov	Monash University

Abstract

Australia is highly dependent on fossil fuels for energy production and transport, and this dependence is growing. Wide spread substitution of liquid hydrocarbon fuels by indigenous renewable bio-oil has the potential to improve Australian's energy outlook and assist in reaching greenhouse gas targets. Understanding the interrelationships between the physical and chemical properties of bio-oil, its atomisation, droplet formation and combustion physics is fundamental to the delivery of an efficient and reliable combustion process using this fuel. Measurements using laser based diagnostics of the atomisation flow, droplet formation and combustion process will provide the experimental data

Allocations

		Count:	Total	2003	2004	2005
Dr V Stamatov	APDC	3	\$193,035	\$64,345	\$64,345	\$64,345
Total			\$193,035	\$64,345	\$64,345	\$64,345