

2001 Research Fellowships by RFCD - contents

230000	MATHEMATICAL SCIENCES	4
240000	PHYSICAL SCIENCES	15
250000	CHEMICAL SCIENCES	11
260000	EARTH SCIENCES	7
270000	BIOLOGICAL SCIENCES	23
280000	INFORMATION, COMPUTING AND COMMUNICATION SCIENCES	1
290000	ENGINEERING AND TECHNOLOGY	12
300000	AGRICULTURAL, VETERINARY AND ENVIRONMENTAL SCIENCES	0
310000	ARCHITECTURE, URBAN ENVIRONMENT AND BUILDING	0
320000	MEDICAL AND HEALTH SCIENCES	0
330000	EDUCATION	0
340000	ECONOMICS	1
350000	COMMERCE, MANAGEMENT, TOURISM AND SERVICES	0
360000	POLICY AND POLITICAL SCIENCE	2
370000	STUDIES IN HUMAN SOCIETY	2
380000	BEHAVIOURAL AND COGNITIVE SCIENCES	7
390000	LAW, JUSTICE AND LAW ENFORCEMENT	0
400000	JOURNALISM, LIBRARIANSHIP AND CURATORIAL STUDIES	0
410000	THE ARTS	0
420000	LANGUAGE AND CULTURE	6
430000	HISTORY AND ARCHAEOLOGY	8
440000	PHILOSOPHY AND RELIGION	1
<hr/> TOTAL NUMBER OF FELLOWSHIPS		100
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DIVISION 230000 MATHEMATICAL SCIENCES

230100 MATHEMATICS	4
230200 STATISTICS	0
239900 OTHER MATHEMATICAL SCIENCES	0
TOTAL NUMBER OF GRANTS	4

DIVISION 240000 PHYSICAL SCIENCES

240100 ASTRONOMICAL SCIENCES	3
240200 THEORETICAL AND CONDENSED MATTER PHYSICS	2
240300 ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE PHYSICS; PLASMA PHYSICS	6
240400 OPTICAL PHYSICS	3
240500 CLASSICAL PHYSICS	0
249900 OTHER PHYSICAL SCIENCES	1
TOTAL NUMBER OF GRANTS	15

DIVISION 250000 CHEMICAL SCIENCES

250100 PHYSICAL CHEMISTRY (INCL. STRUCTURAL)	3
250200 INORGANIC CHEMISTRY	3
250300 ORGANIC CHEMISTRY	1
250400 ANALYTICAL CHEMISTRY	1
250500 MACROMOLECULAR CHEMISTRY	1
250600 THEORETICAL AND COMPUTATIONAL CHEMISTRY	2
259900 OTHER CHEMICAL SCIENCES	0
TOTAL NUMBER OF GRANTS	11

DIVISION 260000 EARTH SCIENCES

260100 GEOLOGY	4
260200 GEOPHYSICS	0
260300 GEOCHEMISTRY	0
260400 OCEANOGRAPHY	1
260500 HYDROLOGY	0
260600 ATMOSPHERIC SCIENCES	1
269900 OTHER EARTH SCIENCES	1
TOTAL NUMBER OF GRANTS	7

DIVISION 270000 BIOLOGICAL SCIENCES

270100 BIOCHEMISTRY AND CELL BIOLOGY	8
270200 GENETICS	0
270300 MICROBIOLOGY	2
270400 BOTANY	2
270500 ZOOLOGY	3
270600 PHYSIOLOGY	0
270700 ECOLOGY AND EVOLUTION	7
270800 BIOTECHNOLOGY	1
279900 OTHER BIOLOGICAL SCIENCES	0

DIVISION 280000 INFORMATION, COMPUTING AND COMMUNICATION SCIENCES

280100 INFORMATION SYSTEMS	0
280200 ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING	1
280300 COMPUTER SOFTWARE	0
280400 COMPUTATION THEORY AND MATHEMATICS	0
280500 DATA FORMAT	0
289900 OTHER INFORMATION, COMPUTING AND COMMUNICATION SCIENCES	0
TOTAL NUMBER OF GRANTS	1

DIVISION 290000 ENGINEERING AND TECHNOLOGY

290100 INDUSTRIAL BIOTECHNOLOGY AND FOOD SCIENCES	0
290200 AEROSPACE ENGINEERING	0
290300 MANUFACTURING ENGINEERING	0
290400 AUTOMOTIVE ENGINEERING	0
290500 MECHANICAL AND INDUSTRIAL ENGINEERING	4
290600 CHEMICAL ENGINEERING	0
290700 RESOURCES ENGINEERING	0
290800 CIVIL ENGINEERING	0
290900 ELECTRICAL AND ELECTRONIC ENGINEERING	1
291000 GEOMATIC ENGINEERING	0
291100 ENVIRONMENTAL ENGINEERING	0
291200 MARITIME ENGINEERING	0
291300 METALLURGY	0
291400 MATERIALS ENGINEERING	4
291500 BIOMEDICAL ENGINEERING	0
291600 COMPUTER HARDWARE	0
291700 COMMUNICATIONS TECHNOLOGIES	1
291800 INTERDISCIPLINARY ENGINEERING	2
299900 OTHER ENGINEERING AND TECHNOLOGY	0
TOTAL NUMBER OF GRANTS	12

DIVISION 300000 AGRICULTURAL, VETERINARY AND ENVIRONMENTAL SCIENCES

300100 SOIL AND WATER SCIENCES	0
300200 CROP AND PASTURE PRODUCTION	0
300300 HORTICULTURE	0
300400 ANIMAL PRODUCTION	0
300500 VETERINARY SCIENCES	0
300600 FORESTRY SCIENCES	0
300700 FISHERIES SCIENCES	0
300800 ENVIRONMENTAL SCIENCES	0
300900 LAND, PARKS AND AGRICULTURE MANAGEMENT	0
309900 OTHER AGRICULTURAL, VETERINARY AND ENVIRONMENTAL SCIENCES	0
TOTAL NUMBER OF GRANTS	0

DIVISION 310000 ARCHITECTURE, URBAN ENVIRONMENT AND BUILDING

310100 ARCHITECTURE AND URBAN ENVIRONMENT	0
310200 BUILDING	0
319900 OTHER ARCHITECTURE, URBAN ENVIRONMENT AND BUILDING	0
TOTAL NUMBER OF GRANTS	0

DIVISION 320000 MEDICAL AND HEALTH SCIENCES

320100 MEDICINE—GENERAL	0
320200 IMMUNOLOGY	0
320300 MEDICAL BIOCHEMISTRY AND CLINICAL CHEMISTRY	0
320400 MEDICAL MICROBIOLOGY	0
320500 PHARMACOLOGY AND PHARMACEUTICAL SCIENCES	0
320600 MEDICAL PHYSIOLOGY	0
320700 NEUROSCIENCES	0
320800 DENTISTRY	0
320900 OPTOMETRY	0
321000 CLINICAL SCIENCES	0
321100 NURSING	0
321200 PUBLIC HEALTH AND HEALTH SERVICES	0
321300 COMPLEMENTARY/ALTERNATIVE MEDICINE	0
321400 HUMAN MOVEMENT AND SPORTS SCIENCE	0
321499 HUMAN MOVEMENT AND SPORTS SCIENCE N.E.C.	0
329900 OTHER MEDICAL AND HEALTH SCIENCES	0
TOTAL NUMBER OF GRANTS	0

DIVISION 330000 EDUCATION

330100 EDUCATION STUDIES	0
330200 CURRICULUM STUDIES	0
330300 PROFESSIONAL DEVELOPMENT OF TEACHERS	0
339900 OTHER EDUCATION	0
TOTAL NUMBER OF GRANTS	0

DIVISION 340000 ECONOMICS

340100 ECONOMIC THEORY	0
340200 APPLIED ECONOMICS	1
340300 ECONOMIC HISTORY AND HISTORY OF ECONOMIC THOUGHT	0
340400 ECONOMETRICS	0
349900 OTHER ECONOMICS	0
TOTAL NUMBER OF GRANTS	1

DIVISION 350000 COMMERCE, MANAGEMENT, TOURISM AND SERVICES

350100 ACCOUNTING, AUDITING AND ACCOUNTABILITY	0
350200 BUSINESS AND MANAGEMENT	0
350300 BANKING, FINANCE AND INVESTMENT	0
350400 TRANSPORTATION	0
350500 TOURISM	0
350600 SERVICES	0
359900 OTHER COMMERCE, MANAGEMENT, TOURISM AND SERVICES	0
TOTAL NUMBER OF GRANTS	0

DIVISION 360000 POLICY AND POLITICAL SCIENCE

360100 POLITICAL SCIENCE	2
360200 POLICY AND ADMINISTRATION	0
369900 OTHER POLICY AND POLITICAL SCIENCE	0
TOTAL NUMBER OF GRANTS	2

DIVISION 370000 STUDIES IN HUMAN SOCIETY

370100 SOCIOLOGY	0
370200 SOCIAL WORK	0
370300 ANTHROPOLOGY	2
370400 HUMAN GEOGRAPHY	0
370500 DEMOGRAPHY	0
370600 HISTORY AND PHILOSOPHY OF SCIENCE AND MEDICINE	0
379900 OTHER STUDIES IN HUMAN SOCIETY	0
TOTAL NUMBER OF GRANTS	2

DIVISION 380000 BEHAVIOURAL AND COGNITIVE SCIENCES

380100 PSYCHOLOGY	3
380200 LINGUISTICS	2
380300 COGNITIVE SCIENCE	2
389900 OTHER BEHAVIOURAL AND COGNITIVE SCIENCES	0
TOTAL NUMBER OF GRANTS	7

DIVISION 390000 LAW, JUSTICE AND LAW ENFORCEMENT

390100 LAW	0
390200 PROFESSIONAL DEVELOPMENT OF LAW PRACTITIONERS	0
390300 JUSTICE AND LEGAL STUDIES	0
390400 LAW ENFORCEMENT	0
399900 OTHER LAW, JUSTICE AND LAW ENFORCEMENT	0
TOTAL NUMBER OF GRANTS	0

DIVISION 40000 JOURNALISM, LIBRARIANSHIP AND CURATORIAL STUDIES

400100 JOURNALISM, COMMUNICATION AND MEDIA	0
400200 LIBRARIANSHIP	0
400300 CURATORIAL STUDIES	0
409900 OTHER JOURNALISM, LIBRARIANSHIP AND CURATORIAL STUDIES	0
TOTAL NUMBER OF GRANTS	0

DIVISION 410000 THE ARTS

410100 PERFORMING ARTS	0
410200 VISUAL ARTS AND CRAFTS	0
410300 CINEMA, ELECTRONIC ARTS AND MULTIMEDIA	0
410400 DESIGN STUDIES	0
419900 OTHER ARTS	0
TOTAL NUMBER OF GRANTS	0

DIVISION 420000 LANGUAGE AND CULTURE

420100 LANGUAGE STUDIES	0
420200 LITERATURE STUDIES	2
420300 CULTURAL STUDIES	4
429900 OTHER LANGUAGE AND CULTURE	0
TOTAL NUMBER OF GRANTS	6

DIVISION 430000 HISTORY AND ARCHAEOLOGY

430100 HISTORICAL STUDIES	5
430200 ARCHAEOLOGY AND PREHISTORY	3
439900 OTHER HISTORY AND ARCHAEOLOGY	0
TOTAL NUMBER OF GRANTS	8

DIVISION 440000 PHILOSOPHY AND RELIGION

440100 PHILOSOPHY	1
440200 RELIGION AND RELIGIOUS TRADITIONS	0
449900 OTHER PHILOSOPHY AND RELIGION	0
TOTAL NUMBER OF GRANTS	1

2301 *MATHEMATICS*

F00103487

Mr SJ Bigelow

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Representations of braids and functions on surfaces by matrices

Summary:

My research objective is to extend and elaborate on my recent work on braids. A braid can be seen as a map from a disc with punctures to itself. Braids have profound and diverse applications to string theory in physics, DNA replication, strange attractors in dynamical systems, hypergeometric equations, and the structure of 3-dimensional spaces. In my PhD thesis I proved the remarkable long-conjectured result that the mathematics of braids can be faithfully represented using matrices. I am seeking to develop some of the numerous applications of this result, and to extend it to even more ubiquitous maps of general surfaces.

F00102978

Mr PS Dodds

Administering Institution: The University of New South Wales

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Theoretical and empirical investigation of scaling, form, and dynamics in complex physical networks

Summary:

An interdisciplinary science of networks is key to understanding complex systems. Networks are universal in nature - cardiovascular systems supply nutrients, central nervous systems carry biological information, and river networks pattern the earth's topography. Nevertheless, we still lack a cohesive theory of networks. This project proposes to generate new and develop existing theories concerning the dynamics, geometry and efficiency of networks. The theory will be motivated by the analysis of real and simulated networks and will draw on many areas of applied mathematics and physics. The project will also focus on the specific examples of river networks and ecological food webs.

F00103515

Prof M Eastwood

Administering Institution: The University of Adelaide

Fellowship Type: Senior Research Fellowship

Panel: F6 Physics and Mathematics

Title: Symmetry and Analysis in Differential Geometry

Summary:

Differential geometry is the study of shape using the calculus. This is a fundamental research project in this area. In particular, it will investigate geometries that are especially symmetric. Classification problems will be considered. Symmetry methods will be used to study integral geometric transforms. Conversely, the integral geometry will illuminate the representation theory of the symmetries. The analysis of differential equations both linear (those defined by involutive structures) and non-linear (for example, the Einstein-Weyl equations) is a further aim. The various aspects of the project are linked by the symmetries that pervade both mathematics and physics.

F00103657

Dr M Varghese

Administering Institution: The University of Adelaide

Fellowship Type: Senior Research Fellowship

Panel: F6 Physics and Mathematics

Title: New approaches to index theory and geometry

Summary:

The core of this research project is to explore novel concepts and techniques in index theory and geometry, most of which have been directly inspired by physics. Recent advances in index theory utilise new geometric objects called gauge-bundles, and unusual uses of projective group actions. Significantly, these and related techniques can be used to help resolve the famous Gromov-Lawson-Rosenberg conjecture concerning existence of positive scalar curvature metrics and the generalised Ten Martini Problem concerning existence of Cantor set spectrum. Substantial contributions towards settling these and related conjectures are expected and would receive worldwide recognition.

2401 *ASTRONOMICAL SCIENCES*

F00105261

Dr A Melatos

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F6 Physics and Mathematics

Title: Neutron Stars: Outflows and Inflows

Summary:

A Neutron Star (NS) is an ultradense, ultramagnetised stellar corpse. I will study how the charged-particle wind of a lone NS interacts with its environment, motivated by recent high-resolution imaging of supernova remnants. I will also study how accreting gas buries the magnetic field of a binary NS, motivated by the imminent commissioning of the first generation of interferometric gravitational-wave telescopes. The work will greatly improve our understanding of NS electrodynamics, the Crab nebula, and the radio emission from millisecond pulsars, and makes a novel, quantifiable prediction of detectable levels of gravitational waves from millisecond pulsars.

F00105235

Dr M Wheatland

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F6 Physics and Mathematics

Title: Energy Storage and Release in Solar Active Regions

Summary:

Solar flares involve explosive release of magnetic energy in the solar atmosphere. This project combines data analysis and theoretical modelling in an attempt to explain the storage and release of energy in flares. The hypothesis that flare energy derives from large scale current systems observed in active regions will be tested, for the first time, using vector magnetogram data. A theoretical model for energy release will be developed based on a propagating, current-driven instability. The new model aims to provide a physical basis to the avalanche model, which successfully accounts for the statistics of flares.

F00104960

Dr AJ Willes

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Fine structures in radio emissions from space

Summary:

Motivated by recent high resolution observations of fine structure in radio emissions from Jupiter and the terrestrial foreshock and magnetosphere, this project aims to provide theoretical explanations for temporal and frequency fine structures in radio emissions from space plasmas. Explanations for fine structure are crucial for our understanding of the physical mechanisms for these emissions. The anticipated outcomes are models for the generation and fine structures of jovian S-bursts, foreshock waves, auroral kilometric radiation, solar type II bursts and magnetospheric waves.

2402 *THEORETICAL AND CONDENSED MATTER PHYSICS*

F00102899

Dr RE Behrend

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Boundaries in statistical mechanics and conformal field theory

Summary:

Important general techniques have recently been developed for studying and classifying boundary conditions in certain two-dimensional statistical mechanical lattice models and associated conformal field theories. The proposed research primarily aims to apply these general methods to a variety of specific cases of significance in physics and mathematics. It is expected that an enhanced understanding of lattice implementations of conformal boundary conditions, of ADE-type classifications of fusion algebras and of boundary critical phenomena will emerge.

F00103377

Dr A Hartmann

Administering Institution: The University of New South Wales

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F6 Physics and Mathematics

Title: Spectroscopic characterisation of depletion layer and band bending at the electrode interfaces of Perovskite titanates and related thin film materials

Summary:

Charge depletion layers at semiconductor/electrode interfaces are key issues for the electrical properties of thin film devices. They are usually characterised indirectly and, e.g. for particular wide bandgap materials, data interpretation can differ significantly. In a novel approach this project proposes to probe depletion layers directly using using depth resolved X-ray absorption spectroscopy. Related band bending and interfaces states will also be monitored. This project will investigate the interfaces of Perovskite titanate thin films and related materials. The focus will not only be on these particular systems but also on further development of a research method which is applicable to other systems.

2403

**ATOMIC AND MOLECULAR PHYSICS; NUCLEAR AND PARTICLE
PHYSICS; PLASMA PHYSICS**

F00102922

Ms NF Bell

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Neutrino phenomenology and particle physics beyond the standard model

Summary:

The phenomenology of neutrino mass and mixing will be investigated. Oscillation scenarios involving both active and light sterile neutrinos will be investigated and constrained based on an analysis of experimental results. Non-standard neutrino properties have significant cosmological implications for baryogenesis, big bang nucleosynthesis and dark matter. Extensions to the standard model of particle physics and signature processes by which they can be identified in collider experiments shall be examined. A determination of the neutrino mass matrix, and evidence found for new physics would provide insight for the construction of new theories and advance our current understanding of fundamental physics.

F00105252

Dr M Bilek

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Experimental and Theoretical Investigation of Sheath Dynamics to Optimise Plasma Immersion Ion Implantation in a Cathodi Vacuum Arc Plasma

Summary:

The plasma immersion ion implantation (PIII) process is ideal for commercial applications as it enables objects of many shapes and sizes to be implanted with ions. The plasma sheath is crucial to PIII as it determines the energy and spatial distributions of implanting ions and hence the implanted dose profile of the modified surface. Stable PIII operation requires the sheath thickness to be kept within strict limits set by electric breakdown and plasma depletion. It is the aim of this work to find the dependence of the sheath properties on the plasma parameters and the substance curvature using both a mathematical model and direct experimental measurement.

F00105503

Dr S Jones

Administering Institution: Murdoch University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Direct numerical solution of Schrödinger's equation for collisions between charged particles and atoms

Summary:

The problem of an electron or other charged particle colliding with an atom is a fundamental one that has yet to be accurately solved. This is because the ionisation boundary condition is difficult to apply and so is usually ignored. Our preliminary work marked the first time that direct matching to ionisation boundary conditions yielded converged ionisation amplitudes (easily the most accurate calculations to date for the Temkin-Poet model of electron-hydrogen scattering). Here we propose to study the full electron-hydrogen collision problem in detail and extend the method to other atoms and projectiles.

F00105721

Dr EG Robertson

Administering Institution: Griffith University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F2 Chemistry

Title: Laser spectroscopic studies of hydrogen bonding in biological molecules

Summary:

The physical properties of hydrogen bonding interactions involving biological molecules such as amino acids, neurotransmitters and amides will be investigated. Laser-based spectroscopic techniques will be applied in combination with ab initio, structural computation to characterise the conformational structures of small biomolecules and their size-selected hydrated molecular clusters, to probe the extent and influence of inter and intramolecular hydrogen bonding within conformers and clusters, and to measure in quantitative terms the dissociation energy of hydrogen bond interactions. The central interpretative aim is to understand how hydrogen bonding interactions determine molecular and electronic structure, and thereby affect physical, chemical and pharmacological behaviour.

F00105174

Dr SV Vladimirov

Administering Institution: The University of Sydney

Fellowship Type: Senior Research Fellowship

Panel: F6 Physics and Mathematics

Title: Collective processes in turbulent and complex plasmas

Summary:

I propose to study fundamental collective processes in non-wquilibrium plasmas such as interactions of collective excitations and charged particles, with emphasis on non-ideal cases: the role of turbulence and impurities on plasma properties, and self-organisation and strong coupling of plasma components. The effects are important for fundamental theoretical physics as well as for many applications in industry, laboratory, space physics, and astrophysics. Advanced theoretical models and modern approaches to analysis of nonlinear systems will be employed. Special attention is paid to recently discovered phenomena such as self-organisation and strong coupling in low temperature complex plasmas.

F00102940

Miss YY Wong

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: Studies in particle cosmology and phenomenology.

Summary:

This project aims to investigate the role played by the neutrino in various astrophysical and cosmological contexts. Data from SNO will be analysed to establish some of the mass and mixing parameters in the neutrino sector that are necessary for model building, and also the existence or otherwise of sterile flavours. The effects of neutrino oscillations on supernova dynamics, r-process nucleosynthesis, and in other extraterrestrial neutrino emitters will also be studied to achieve a better understanding of these processes. The quantum kinetic equations will be solved which may have implications for aspects of atomic physics.

2404 *OPTICAL PHYSICS*

F00105118

Dr J Canning

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Glass Photosensitivity and its utilisation for advanced glass structural control within novel all-optical devices

Summary:

Glass photosensitivity has allowed the fabrication of a range of all-optical components, despite being poorly understood. This project aims to clarify the underlying mechanisms and develop a general picture which is not particular to any one glass system. It builds on recent insights gained which show that characteristic photo-responses are similar amongst a range of media, thereby opening up the possibility of utilising established bulk technologies in waveguide form as well as developing novel optical materials and components where complete structural control is possible.

F00105557

Dr H Tan

Administering Institution: The Australian National University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Growth, Characterisation and Fabrication of GaInNAs lasers and intermixing in GaInNAs Quantum Wells for Photonic Device Integration.

Summary:

This project addresses one of the hottest topics in semiconductor optoelectronics, namely the development of vertical cavity surface emitting lasers (VCSELs) operating at 1.3 and 1.55 μm wavelength for applications in long haul optical communications. It involves the study of an exciting new class of semiconductor materials leading to the fabrication of the VCSELs and the use of a novel technique to intermix layers in these materials for photonic device integration. Layer intermixing in these new materials can potentially lead to the integration of photonic devices of different wavelengths on the same chip for wavelength division multiplexing applications.

F00103588

Dr W Xu

Administering Institution: University of Wollongong

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F6 Physics and Mathematics

Title: Generation of coherent-hypersound from semiconductor systems.

Summary:

Coherent-hypersound is an entirely new source of high frequency ultrasound with a pure frequency and coherent nature. It can be extensively applied in industry, medical treatment and scientific research, especially in ultrasonic and electronic devices. In this project, I will investigate the generation and propagation of coherent-hypersound with frequency~1 terahertz using state-of-the-art semiconductor and laser techniques. I intend studying theoretically the coherent-hypersonic generation via emission of coherent-phonons in GaAs- and GaN-based systems, in conjunction with different experimental techniques. This project will be carried out in collaboration with local and international experimental groups.

2499 *OTHER PHYSICAL SCIENCES*

F00106073

Mr JG Hartnett

Administering Institution: The University of Western Australia

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F6 Physics and Mathematics

Title: New secondary frequency standard for space applications

Summary:

Optimization and construction of a compensated resonator with a null in the frequency/temperature characteristic near 50 K. A 9.19 GHz (cesium hyperfine transition line) resonator will be constructed for use in a "flywheel" oscillator for cesium fountain atomic clocks and the PHARAO cold atom space clock. Initially, to build an oscillator with current state-of-art electronics and a fractional frequency instability of order 10^{-14} and then to advance this to 10^{-15} by implementing novel techniques to improve line splitting factor in Pound stabilized oscillators.

2501 *PHYSICAL CHEMISTRY (INCL. STRUCTURAL)*

F00104888

Dr MC Barnes

Administering Institution: University of South Australia

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F2 Chemistry

Title: **The Mechanism of Thin Film Formation Using the Charged Cluster Model**

Summary:

The project aims to clarify the application of the Charged Cluster Model theory to the formation mechanism of thin films. Thin films science has many applications in high-technology industries e.g. communications, optical electronics, coatings, energy generation and conservation strategies. The expected outcomes of this project are: to develop a methodology for controlling cluster sizes and size distribution; to determine how film microstructure corresponds to cluster size and the relationship between epitaxy and cluster size; to develop methodologies for the efficient production of cheaper epitaxial thin films and; the production of quantum dots and nano-powders.

F00102929

Dr S Huntington

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F2 Chemistry

Title: **Application of Evanescent Wave Optics to the determination of absolute distance in surface force measurements using the Atomic Force Microscope (AFM)**

Summary:

In direct force measurements using the AFM, the absolute distance between the AFM tip and the surface of interest is not known unequivocally. This presents a particular problem when dealing with surface adlayers, where maximum compression exerted between surfaces cannot be assumed to correspond to intimate contact between them. This project aims to develop a new technique for determining the absolute separation between the AFM tip and surface by combining a conventional AFM system with Scanning Near Field Optical Microscopy (SNOM). The new technique will allow detailed studies of previously inaccessible surface coating structure and thickness, opening new avenues of research in direct force measurement.

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F00103416

Dr RD Webster

Administering Institution: The Australian National University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F2 Chemistry

Title: In Situ Electrochemical NMR Spectroscopy

Summary:

Many organic and inorganic chemical processes that involve the transfer of electrons can be controlled by electrochemical techniques. Often it is desirable to combine the electrogeneration with a spectroscopic method of analysis in order to monitor the reaction progress and to identify intermediate species. This project is directed at overcoming the experimental difficulties of combining in situ electrochemistry with one of the most widely used and powerful spectroscopic techniques, NMR spectroscopy, and applying the new technology for the first time to studying electron transfer and electron exchange reactions of industrial, biological and academic importance.

2502 *INORGANIC CHEMISTRY*

F00103375

Dr S Batten

Administering Institution: Monash University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F2 Chemistry

Title: Functional Coordination Polymers and Supramolecules

Summary:

This project examines the synthesis, structure and physical properties of new coordination polymers and supramolecules. In particular, new materials with interesting magnetic properties will be made. By studying the systems proposed, we hope to gain a greater understanding of the relationship between structure and magnetic properties. In addition to the purely scientific interest these materials will have, work in this area will ultimately provide new materials for applications in electronics and computing. On a more fundamental level, a new approach to the construction of heterometallic coordination polymers will be examined, and microporous coordination polymers with greater stability will be made.

F00104951

Dr DE Hibbs

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F2 Chemistry

Title: Experimental Charge Density Studies and Drug Design

Summary:

Rational development of new pharmaceuticals depends on high quality models for the drug/target interactions. Exciting new experimental and theoretical developments now allow information on electron distributions in drugs to be determined reliably. In this project we will use these methods to investigate flavonoids, an important new class of receptorial drugs, derived from plant sources and having cancer prevention properties. The second goal is to extend the methodologies so they can be used to derive reliable models for platinum anticancer drugs, one of the three major classes of anticancer drug in use today.

F00106392

Mrs P Meakin

Administering Institution: CSIRO, Manufacturing Science and Technology

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F2 Chemistry

Title: Electrodeposition of Metals from Ionic Liquids at Room Temperature

Summary:

This project examines novel ionic liquid electrolyte systems for the electrodeposition of metals at room temperature. Application of ionic liquids for this process is the enabling component in this chemistry and a radical shift from the conventional commercial high temperature electrolyte practice. If successful, this project should have a significant impact on several of Australia's important commercial metal extraction and corrosion industries. The outcome will be the development of a scientific basis for the efficient electrodeposition of aluminium, magnesium, zinc, titanium and scandium metals through: identification of key metal ion chemistry in liquid electrolyte systems; examination and optimisation of electrodeposition processes; identification of potential issues to scale-up.

2503 *ORGANIC CHEMISTRY*

F00106342

Dr BD Kelly

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F2 Chemistry

Title: Chemoenzymatic Routes to the Spinosyns - A New and Environmentally Benign Class of Insecticide.

Summary:

The spinosyns, discovered by Dow-Agro Sciences and now marketed under the tradename Tracer, are a new group of structurally complex and naturally derived insect control agents originally isolated from bacterial sources. These compounds show especially good activity against a broad spectrum of lepidoptera, the control of which represents a \$(US) 1.5 global market. The aim of this project is to identify, through extensive biological evaluation of synthetic analogues, the toxic subunits (toxiphores) responsible for the insecticidal activity associated the spinosyns in an effort to provide new lead compounds suitable for field trials.

2504 *ANALYTICAL CHEMISTRY*

F00103312

Dr S Poulsen

Administering Institution: Griffith University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F2 Chemistry

Title: Development of Dynamic Combinatorial Chemistry as a superior approach to therapeutic lead discovery.

Summary:

The rapid discovery and development of new pharmaceuticals is one of the most important challenges for chemistry, both now and in the future. The objective of this project is to develop dynamic combinatorial chemistry (DCC) as a conceptually different but superior strategy to therapeutic lead discovery over conventional combinatorial chemistry. This research will place Australia in a leading position with technology that may ultimately change the manner in which the pharmaceutical industry pursues drug discovery.

2505 *MACROMOLECULAR CHEMISTRY*

F00106065

Dr J Wilce

Administering Institution: The University of Western Australia

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F0 Molecular and Cell Biology

Title: Biophysical studies of mRNA-binding proteins involved in the regulation of gene expression

Summary:

RNA-protein interactions are now recognised as a major control point in the regulation of gene-expression. Proteins such as HuR act to stabilise and transport specific messenger (m)RNAs, and thus determine their translation levels. In contrast to such an important function, very little is known about these mRNA-protein interactions at an atomic level. In the current study we propose to solve the three-dimensional structures of HuR, as well as a novel mRNA-binding domain from the Grb adapter protein family, and characterise their interactions with their cognate mRNA sequences using X-ray crystallography and NMR spectroscopy.

2506 *THEORETICAL AND COMPUTATIONAL CHEMISTRY*

F00105999

Dr D Jayatilaka

Administering Institution: The University of Western Australia

Fellowship Type: Senior Research Fellowship

Panel: F2 Chemistry

Title: **Wavefunctions directly from scattering experiments**

Summary:

New models of software will be developed for routinely extracting quantum mechanical wavefunctions directly from scattering experiments - especially the X-ray diffraction, polarised neutron diffraction, and (e, 2e) scattering experiments. The new analysis will allow us to see for the first time current densities and individual orbitals in molecules, as well as establishing the accuracy of first principles wavefunction calculations for chemically important properties such as the charge and spin density, and electrostatic potential. Low temperature X-ray experiments will be used to validate previously reported experimental errors important for the proposed experimental wavefunctions extraction procedure.

F00105301

Dr J Reimers

Administering Institution: The University of Sydney

Fellowship Type: Senior Research Fellowship

Panel: F2 Chemistry

Title: **Theoretical modeling of chemical systems, with applications to excited states, intermolecular interactions, bacterial photosynthesis and molecular electronics**

Summary:

This project will model and hence understand a wide range of chemical phenomena related to molecular excited states and intermolecular interactions. During the next decade, computational methods will be developed that can satisfactorily solve excited-state problems on large systems, and this project is at the forefront of the developing technology. Major focuses of the project include aspects of the mechanism of bacterial photosynthesis, with applications to plant photosynthesis and artificial photovoltaic devices, as well as the development of new devices for the use in a burgeoning molecular electronics industry.

2601 *GEOLOGY*

F00106125

Dr SR Allen

Administering Institution: University of Tasmania

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F3 Earth Sciences

Title: Experimental Simulations and Textural Analysis of Submarine Volcaniclastic Mass Flow Deposits that Result from Large-scale Eruption and Failure Events

Summary:

Explosive eruptions and mass failure events on volcanic cones can deliver large quantities of volcanic particles into the sea. Deposits from such events are found throughout ancient submarine volcanic successions, yet presently there are no physical constraints linking deposit features with origin. This research will use field studies, detailed textural analysis and novel experimental simulations to characterise a variety of such submarine deposits and clarify relationships between their characteristics and source circumstances. The correct identification of deposits of this type is critical in understanding submarine volcanic successions, especially those in altered, deformed and metamorphosed terranes

F00103660

Dr J Magee

Administering Institution: The Australian National University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F3 Earth Sciences

Title: The Environmental Context of Megafaunal Extinction in Australia.

Summary:

The relative roles of climate change and humans in the late Quaternary extinction of the Australian large animal fauna (megafauna), has long been a contentious debate. Recently, a better chronology for key events, namely megafauna demise at 50 ± 5 ka soon after human arrival at 55 - 60 ka suggests, but does not prove, a human cause for megafaunal extinction. This project will investigate the human megafauna link and examine the role of climate change in the extinction by improving the chronology for the events and by a detailed investigation of environmental conditions, before during and after the extinction event at four key sites.

F00102944

Dr TJ Rawling

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F3 Earth Sciences

Title: An investigation of the cause and effect of tectonic oscillations during orogenesis

Summary:

This research will investigate the nature of tectonic oscillations (switches between extension and contraction) at all scales during orogenesis (mountain building). The applicant will constrain the timing of oscillations and investigate their impact on the tectonic development of the western European Alps. Orogenic oscillations are thought to be common during mountain building but are presently poorly understood. This research will allow the nature of tectonic "events" during mountain building and denudation to be re-evaluated. It will also consider whether a mountain belt acts as a complex self-organised critical system during orogenesis.

F00103154

Dr RG Roberts

Administering Institution: The University of Melbourne

Fellowship Type: Senior Research Fellowship

Panel: F3 Earth Sciences

Title: Single-grain optical dating: systematics, statistics and applications in the earth and archaeological sciences

Summary:

Reliable dating methods are needed to obtain accurate ages for geological and archaeological events. Optical dating exploits the photon-stimulated luminescence (PSL) emissions from sediment grains exposed to sunlight before burial. Contaminant grains can be detected by examining grains individually, but the PSL behaviour of individual grains is poorly understood. This project will improve our understanding of single-grain PSL behaviour and provide (1) reliable ages for deposits associated with palaeoclimate change, megafaunal extinction, rock art, and human arrival in Australasia, and (2) data needed to address current debates about ENSO variability, processes of sediment transport and mixing, and soil carbon turnover.

F00104281

Mr A Kiss

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F3 Earth Sciences

Title: **The Response of Ocean Models to Variable Wind Forcing.**

Summary:

Variability of wind-driven mid-latitude ocean circulation has important consequences for climate, but little is known about the role of fluctuating wind forcing in this variability. This project will provide significant new insights into this problem by using a novel combination of numerical models and laboratory experiments to investigate the response of ocean circulation to variable wind forcing. Building on current studies of circulations produced by steady forcing I will characterise the variability induced by unsteady forcing, analyse the physical mechanisms of the flow instabilities (in particular the role of topography), and determine the implications for simulations of ocean circulation.

2606 *ATMOSPHERIC SCIENCES*

F00103577

Prof JS Risbey

Administering Institution: Monash University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F3 Earth Sciences

Title: **Detection and Attribution of Climate Change**

Summary:

This project develops and applies a probabilistic framework for detecting climate change and attributing likelihoods of possible causes of any detected changes. It uses both expert judgement and results from climate model simulations to assess uncertainties. A broad range of indicators of climate change will be tested and used to make assessments about large scale climate changes. These results will be used by the international research community to communicate knowledge on climate change to broader publics and the policy process (via the Intergovernmental Panel on Climate Change). The framework will also be applied to assess the significance and potential causes of trends in extreme climate events in the Australian region, including an assessment of ENSO, storms, and droughts. The results will be invaluable to farmers, agricultural agencies, and water resource planners.

2699 *OTHER EARTH SCIENCES*

F00102888

Dr J Woodhead

Administering Institution: The University of Melbourne

Fellowship Type: Senior Research Fellowship

Panel: F3 Earth Sciences

Title: **Crustal recycling: evolving concepts and critical tests**

Summary:

The geochemical evolution of the Earth's mantle is determined by global-scale cycles in which crustal material is both returned to the planet's interior at subduction zones and formed during episodes of basaltic magmatism. This proposal employs state-of-the-art analytical techniques to test existing models describing mass transfer processes occurring in the first part of this cycle (subduction). This will result in an improved estimate of the role played by subducting slabs in the source of intraplate magmas (the second part of this cycle).

2701 *BIOCHEMISTRY AND CELL BIOLOGY*

F00103718

Dr A Chapman-Smith

Administering Institution: The University of Adelaide

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F0 Molecular and Cell Biology

Title: The mechanism of action of the bHLH/PAS transcriptional regulators

Summary:

The project proposes a mechanistic and structural study of the macromolecular interactions that determine the specificity of protein dimerization and DNA recognition by the basic Helix-Loop-Helix/PAS transcriptional regulators. This emerging class of proteins have critical functions in biology, including responding to low oxygen levels and mediating the severe toxicity associated with dioxin poisoning. Our molecular understanding of these proteins and their complex interactions is currently derived from qualitative and largely descriptive data. Using the techniques of protein chemistry to investigate their mechanism of action is timely and will contribute to our understanding of a fundamental area of molecular cell biology.

F00106443

Dr E Coulson

Administering Institution: Walter & Eliza Hall Institute of Medical Research

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: Mechanisms of signalling neuronal death through the p75NTR neurotrophin receptor

Summary:

The mechanism of neuronal cell death during development and in neurodegeneration is not well understood. The p75NTR death signalling receptor mediates cell death in these conditions but how it does so is not well characterised at this time. We have recently identified the cytoplasmic domain of p75NTR, Chopper, which is responsible for initiating intracellular death signalling pathways. This project aims to characterise this pathway by identifying and characterising proteins that participate in death signalling. This knowledge will further our understanding of neuronal death pathways and will be significant for determining suitable treatments for neurological conditions, possibly leading to new therapeutic targets.

F00104405

Dr D Laver

Administering Institution: The Australian National University

Fellowship Type: Senior Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: Mechanisms Governing Regulation of Ryanodine Receptor Function.

Summary:

Intracellular calcium concentration, and hence cell function, is regulated by the release of calcium from the internal stores. In striated muscle this occurs via ryanodine receptors (RyRs). Modulation of RyR function by cytoplasmic constituents is central to their role in muscle contraction. However, these modulatory mechanisms are complex and poorly understood. Single channel studies of recombinant RyRs in artificial membranes carried out here is the only way of examining RyRs in sufficient detail to tease out these mechanisms. The outcome will be much deeper understanding of how RyRs are regulated by cell metabolism under normal and pathological conditions.

F00106445

Dr S Nicholson

Administering Institution: Walter & Eliza Hall Institute of Medical Research

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: Investigation of the biochemical and physiological function of the SOCS family proteins, SOCS-4 and SOCS-5.

Summary:

Cytokines are a group of secreted proteins which regulate blood cell development and a wide variety of biological processes. They act by binding to a receptor protein on the surface of cells and ultimately direct the cells response to its environment, ie growth/activation/survival. We have discovered a new family of proteins called SOCS which negatively regulate these responses. This project aims to investigate the physiological and biochemical role of two of these family members, SOCS-4 and SOCS-5. Understanding how these proteins act at a biochemical level may provide the information required to develop new therapeutic agents for treatment of human diseases.

F00106082

Dr A Oakley

Administering Institution: The University of Western Australia

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: The mechanism of action of replication termination protein

Summary:

Termination of DNA replication is poorly understood. Prokaryotic cells present an excellent model system for the investigation of this process. Studies have shown that replication machinery is halted at specific DNA sites where a terminator protein is bound. The project seeks to determine how replicator terminator protein (RTP) of *Bacillus subtilis* recognizes DNA terminator sites and how it prevents replication from proceeding. X-ray crystallography will be used to examine the precise molecular interactions of RTP and terminator sites, and its interaction with DNA unwinding protein helicase. These results will provide much needed insight into this important phenomenon.

F00103019

Dr S Richardson

Administering Institution: The University of Melbourne

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F0 Molecular and Cell Biology

Title: Evolution of transthyretin structure and function : implications for thyroid hormone distribution in body and brain

Summary:

Thyroid hormones are important for normal growth and development, and for many regulatory functions in adult life. Thyroid hormones are lipid-soluble and rapidly partition from the bloodstream into cell membranes. Therefore, they bind to specific plasma proteins, such as transthyretin, to ensure their appropriate distribution throughout the body. Transthyretin also transports thyroid hormones across the blood-brain barrier into the brain. We will investigate the effects of transthyretins with differing affinities for thyroid hormones, and how this impacts on the distribution of thyroid hormones in the body and into the brain. This work should lead to new insights into the evolution of thyroid hormone distribution in vertebrates.

F00106453

Dr R Starr

Administering Institution: Walter & Eliza Hall Institute of Medical Research

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F0 Molecular and Cell Biology

Title: In vivo characterisation of suppressor of cytokine signalling (SOCS) function.

Summary:

Cytokine signal transduction pathways are tightly regulated processes which are governed by a balance between positive and negative signals. The SOCS proteins are negative regulators which limit responses to cytokine. Mice lacking SOCS-1 die neonatally due to hypersensitivity to interferon γ . This proposal aims to extend this work by examining SOCS-1^{-/-} mice for aberrant responses to other cytokines, and to determine the specificity within the SOCS family by generating mice lacking two or more SOCS genes. Understanding the physiological role of the SOCS proteins will aid in the development of SOCS inhibitors and agonists which may be useful therapeutic agents.

F00103640

Dr CG Warr

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: Olfactory Signalling and Coding in Drosophila and Other Insects.

Summary:

Animals rely on olfactory cues to detect food, danger and others of the same species. A large family of candidate odorant receptors has recently been identified in *Drosophila*. This project aims to investigate the role of these odorant receptors in olfactory signalling and coding via a detailed study of their cellular expression patterns and subcellular distribution. I also aim to isolate receptors from other insects of agricultural importance, and to use receptors from both *Drosophila* and other insects as an entry point to isolate components of the downstream signalling pathway, likely to be conserved across insect species.

2703 *MICROBIOLOGY*

F00103243

Dr S Dickson

Administering Institution: The University of Adelaide

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Sealing off arbuscules: a means to a functional end in plant mycorrhizal symbiosis

Summary:

Arbuscular mycorrhizal fungi increase uptake of nutrients (particularly phosphate) by plants. The mechanisms involved in P transfer from fungus to plant are still unclear, but the mycorrhizal arbuscule is believed to play a central role. This project investigates development and significance of the newly discovered structure - a cross wall in arbuscular trunk hypha, in a range of mycorrhizal fungus-plant associations. Cross wall formation will be linked to physiological conditions in the symbiotic interface and to activity of adjoining membranes and hence to arbuscular functionality. This will provide important insights into mechanisms of nutrient transfer in these ubiquitous symbioses.

F00105474

Mr JS Webb

Administering Institution: The University of New South Wales

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: In-situ production of extracellular inhibitory compounds in *Pseudoalteromonas tunicata* biofilms

Summary:

The newly identified marine bacterium *Pseudoalteromonas tunicata* produces a number of novel inhibitory compounds each with specific activity against a range of target marine fouling organisms. Exploitation of these antifouling molecules will lead to a highly innovative approach towards the control of marine biofouling and may allow for the development of environmentally clean biocides and novel biological control agents. This project aims to explore the role of the inhibitory compounds in the control of marine biofilms, and to elucidate how *P. tunicata* regulates the production of its inhibitory compounds in natural biofouling situations.

2704 *BOTANY*

F00103165

Dr T Chiovitti

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Characterisation of bioadhesives from marine diatoms

Summary:

Biofouling occurs at great expense to governments and industry, adding up to 60% annually to the cost of propulsive fuel consumption in shipping. Diatoms include the most common algal biofoulers of natural and artificial surfaces (e.g. ship hulls). The structure of diatom adhesives will be elucidated in order to determine the molecular basis of their adhesive properties. This knowledge will contribute to development of new adhesives or strategies to modify and/or prevent adhesion. As diatoms are capable of reversing adhesion, an understanding of this mechanism may enable development of strategies to counter adhesion in antifouling products (e.g. paints).

F00104004

Dr O Ghannoum

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Causes and Consequences of the Differences in Leaf Biochemistry and Structure Between NAD-ME and NADP-ME C4 Grasses.

Summary:

An intriguing feature of tropical (C₄) grasses is their diversification into subtypes with characteristic leaf biochemistry and structure. The functional significance of these characteristics at the leaf and plant level is unknown. This project builds on my previous research and will determine how the interplay between leaf and biochemistry and structure influences plant growth. The project has a high chance of success because the supervisors and the application are experienced in this area and the research environment is excellent. The results will provide critical insight into the basic physiology of C₄, which underpins the management of Australia's fragile tropical grasslands.

2705 *ZOOLOGY*

F00105418

Dr K Benkendorff

Administering Institution: University of Wollongong

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: A biorational approach to antibacterial lead compound discovery in southern Australian marine molluscs

Summary:

The evolution of resistance to antibiotics presents a serious problem and requires the development of new antimicrobial agents. Focussing on southern Australian marine molluscs, this project will use a biorational approach to drug discovery, which involves utilising the deductive powers of biology. Specifically, it is hypothesised that antibacterial agents are widely used to protect the egg stage of marine molluscs and that the biosynthesis of antibacterial agents could be induced in adult molluscs in response to immunological challenge. By examining molluscan taxa that have not been the focus of previous natural products research it is predicted that some novel bioactive metabolites could be identified.

F00106396

Dr Z Johanson

Administering Institution: Australian Museum

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F1 Plant and Animal Biology

Title: Dental and skeletal homologies of the Gnathostomata (jawed vertebrates)

Summary:

Aims include identification of homologous morphological characters within the Gnathostoma (jawed vertebrates including fish and tetrapods), the evolutionary relationships of which, at various taxonomic levels, are currently in flux. Homologies are the basis of any phylogenetic analysis; thus, new or revised homologies will provide valuable information for resolving these problematic relationships. The significance of this research includes recognition of potential homologies that span the Gnathostoma, and can thus address fundamental questions in vertebrate evolution. Investigations will focus primarily on the dentition and the postcranial skeleton of placoderms and lungfishes, including fin girdles, associated musculature, and the vertebral column

F00104897

Dr J Marshall

Administering Institution: The University of Queensland

Fellowship Type: Senior Research Fellowship

Panel: F1 Plant and Animal Biology

Title: The colourful world of coral reefs: a fish's eye view.

Summary:

Many of the natural inhabitants of The Great Barrier Reef use the vibrant language of colour to communicate with each other. However, the way they see their colourful world bears no resemblance to the way it appears to human visitors. To visualise the reef's colours as reef fish do and then use this knowledge to unravel some of their complex social interactions is my long term goal. New technology to Australia will be used to examine the almost entirely unknown colour vision capabilities of reef fish and will take us a step closer to decoding their colourful language.

2707 *ECOLOGY AND EVOLUTION*

F00105125

Dr P Archambault

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Spatial-scale and species biodiversity of algae in response to natural and anthropogenic disturbance.

Summary:

This project will test hypotheses about mechanisms causing maintenance and disappearance of biodiversity and abundance of algae. These include experimental tests of influences of small-scale topographic heterogeneity on colonisation of algae and the establishment of algal species in relation to different sizes and severities of disturbances. A new and inexpensive method using infra-red pictures will be used to quantify algae in different habitats. This project will help to 1) predict responses of the environment to different disturbances, 2) understand factors enhancing diversity and 3) develop guide-lines for eventual management of coastal conservation.

F00105272

Dr LD Bromham

Administering Institution: The University of Queensland

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F1 Plant and Animal Biology

Title: Evolving Molecular Clocks: the effect of tempo and mode of molecular evolution on phylogenetic analyses.

Summary:

Understanding tempo and mode of molecular evolution is essential for the increasing range of disciplines in biology, medicine and conservation that use molecular data. Species differ in rate of molecular evolution, so rates must evolve along lineages. Evolving rates of DNA evolution complicate the use of DNA data, could lead to serious errors in current analyses. I will combine investigation of patterns and causes of rate variation with new statistical methods to improve bioinformatic analysis. This project will contribute significantly to the theoretical understanding of molecular evolution and will have important practical benefits for bioinformatics.

F00103998

Ms S Downes

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Consequences of Animal Dispersal in Fragmented Landscapes: An Experimental Approach.

Summary:

Theory suggests that increased animal dispersal between isolated habitat patches can enhance important ecological processes, and that these consequences may depend on the densities of populations in the patches that are colonised. Unfortunately, there have been few empirical tests of this notion because most fragmented landscapes are unsuitable for rigorous experimental designs. I propose to address this gap in knowledge by using a small common garden skink as a model experimental system. This study will test a diverse array of hypotheses that have received little empirical investigation, but also will have significant ramifications for management and conservation of fragmented landscapes.

F00102874

Dr DA Driscoll

Administering Institution: University of Tasmania

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Spatial Structuring and the Genetic Consequences in Rainforest-Dependent Invertebrates from Tasmania: An Empirical Test of Metapopulation Theory

Summary:

Despite recent reviews, it is premature to conclude that metapopulation dynamics are rare. Carefully targeted empirical research is required. I will use patch occupancy, generalised linear modelling and genetic studies, to determine the prevalence and type of metapopulations formed by rainforest-specific ground invertebrates in Tasmania. I will also test the hypothesis that metapopulation dynamics reduce regional genetic variation. This project will be an important contribution to our understanding of metapopulation dynamics in nature as well as providing guidance in the conservation of invertebrates.

F00103335

Dr BM Gillanders

Administering Institution: The University of Adelaide

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F1 Plant and Animal Biology

Title: Understanding population replenishment and movements of fish using trace elements in ear bones

Summary:

Trace elements in ear bones of fish will be used to provide new information about the nursery hypothesis, a critical but poorly understood theory in marine ecology. Nursery or natal habitats of adult fish will be identified to develop models of population replenishment. This work will provide information that is central to understanding the movement of fishes between nursery and adult populations. In addition, the ability of environmental variables to identify the historical habitats utilised by fish will be evaluated. This research is a priority area of fisheries research and has considerable significance for fisheries management and conservation of fishes.

F00105132

Dr T Madsen

Administering Institution: The University of Sydney

Fellowship Type: Senior Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Parasites, immunogenetics and fitness: studies on a long-lived predator in tropical Australia

Summary:

High levels of genetic variation characterise many natural populations. Host-parasite interactions have been suggested as a mechanism that maintain this variation, but empirical evidence is scarce. To test this hypothesis, I aim to take advantage of a unique opportunity that has emerged from my long-running studies on water pythons (*Liasis fuscus*). I will assess (i) whether parasite loads affect fitness (by experimentally eliminating parasites in a subset of snakes); (ii) whether individual variation at major histocompatibility complex (MHC) loci affects parasite loads and fitness; and (iii) whether fluctuations in prey abundance will affect host-parasite interactions.

F00104999

Dr J Melville

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F1 Plant and Animal Biology

Title: Evolutionary ecology and molecular systematics of desert agamid and iguanid lizards

Summary:

This study will quantitatively investigate community convergence through a comparative study that combines molecular systematics and field observations in several assemblages of desert agamid and iguanid lizards. Although comparative phylogenetic techniques have advanced in the past few years and are the most appropriate means of assessing lineage-specific historical effects on community composition, they have rarely been used in community studies. Our study will take a comparative approach that combines ecological and phylogenetic information to generate several types of data for biogeographic and historical analyses, which will allow hypotheses concerning convergence in these assemblages to be tested.

2708 *BIOTECHNOLOGY*

F00105701

Ms B Forster

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F0 Molecular and Cell Biology

Title: Molecular and Biochemical Mechanisms of Photosynthetic Acclimation to Very High Light.

Summary:

My aims are to evaluate underlying mechanisms that may explain resistance to very high light (VHL) in mutants of *Chlamydomonas reinhardtii* (VHLR mutants) that I discovered and partially evaluated during my PhD. These different, single gene mutations are likely to affect different aspects of photoprotection and resistance to photoactivation in VHL, and can only be assessed in a laboratory broadly experienced in molecular, biochemical and biophysical mechanisms of photoprotection and photoinactivation. Eventually, VHLR genes from *Chlamydomonas* may be valuable for introducing this trait into agronomically relevant plants, potentially enabling achievement of greater resistance to high light stress.

2802

ARTIFICIAL INTELLIGENCE AND SIGNAL AND IMAGE PROCESSING

F00106387

Mr DJ Austin

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Non-monotonic Mapping for Mobile Robots in Dynamic Environments

Summary:

Aim: To develop effective methods for mobile robots to build maps in environments containing moving objects. **Significance:** For many applications, a mobile robot must be able to develop and maintain a map of its environment autonomously. However, existing map building techniques assume that the environment surrounding the robot is static. This assumption cannot be justified in the real world where people, other robots and furniture all change position over time. **Outcomes:** This project will develop mapping methods for objects that change position occasionally (eg furniture), methods for detecting and mapping dynamic objects (eg people) and methods for simultaneously estimating the robot position and mapping the environment.

2905 *MECHANICAL AND INDUSTRIAL ENGINEERING*

F00105814

Prof R Antonia

Administering Institution: The University of Newcastle

Fellowship Type: Senior Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: A Reappraisal of Small-Scale Turbulence

Summary:

The thrust of this project is to gain a realistic insight into the behaviour of small-scale turbulence by taking account of the effect of the Reynolds number and the nature of the flow, including differences in boundary and initial conditions. Results from the proposed theoretical and experimental investigations should provide a better understanding of the parameters that affect the small-scale motion and allow extrapolation from laboratory Reynolds numbers to the significantly higher Reynolds numbers associated with environmental and industrial flows. Applications include the mixing of different species in turbulent combustion and the dispersion of particles in the environment.

F00105542

Mr Q Li

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Evolutionary Structural Optimisation for Advanced Engineering Design

Summary:

Structural design optimisation is considered to be one of the most challenging and most rewarding tasks in engineering design area. It is a fusion of skills in mechanics, computational methods and computer science. The principle objective of this research is to expand the well-established evolutionary structural optimisation (ESO) method to advanced engineering design for complex physical and structural systems. The topics will cover (1) multi-component structures, (2) compliant mechanism/ artificial extreme micro-materials, (3) poly-physical fields and (4) contact/ impact problems. The research will lead to a significant advancement in the evolutionary algorithms and desing optimisation, and will provide design engineers with a simple, efficient and reliable tool in their familiar design platform.

F00106004

Mr K Sum

Administering Institution: The University of Western Australia

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Acoustics of enclosed spaces in the awkward frequency zone

Summary:

The aim of this project is to investigate the interaction/coupling between sound waves in enclosures and their boundary structures, and characteristics of sound absorption induced by the coupling in the awkward frequency zone (ie medium frequency range). The completion of the project will provide an insight into medium frequency statistical behaviours of spatial and frequency distributions of magnitude and phase responses of enclosed sound fields, as well as a new description for the medium frequency sound absorption by modally reactive boundaries in terms of averaged modal properties of the structures. These expected outcomes will bridge the gap between the low frequency and high frequency understandings in acoustics of enclosed spaces, and provide a foundation for the future development of new methods to predict the medium frequency response of enclosed sound fields.

F00103523

Dr A Zinoviev

Administering Institution: The University of Adelaide

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Investigation of the acoustic near field of a scattering object and the control of scattered sound in a shallow ocean.

Summary:

Previous work by the applicant has shown the importance of the acoustic field near a 2-dimensional scattering object in determining the properties of the sound field far from the object. The aim of the proposed project is to investigate how the sound field near a 3-dimensional scattering body may be related to the far field and hence to develop new methods for active control of the scattered sound field. The work will lead to the development of more efficient acoustic technologies for sonar systems, geological exploration and exhaust noise muffling devices.

2909

ELECTRICAL AND ELECTRONIC ENGINEERING

F00106066

Ms G Parish

Administering Institution: The University of Western Australia

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Analysis of carrier behaviour in GaN/AIGaN materials and devices, with application to improved microwave transistors and ultraviolet detectors

Summary:

Gallium nitride and its alloys with indium and aluminium has emerged as a leading semiconductor system for a number of important applications. In this relatively new field further understanding of carrier behaviour in the material and devices is crucial to obtaining improvements in device performance. This project will - characterise electron and hole behaviour in p-type GaN material and devices, and thus improve growth and processing techniques for maximum device efficiency. - characterise charge trapping in AlGa_{0.3}N_{0.7}GaN-based microwave transistors so that growth and processing techniques can be improved for maximum device efficiency. - Design, process and test high efficiency solar-blind ultraviolet detectors.

F00105361

Mr X Liao

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: Transmission Electron Microscopy Investigation of the Microstructures of Semiconductor Quantum Dots

Summary:

Semiconductor quantum dots (QDs) show great potential for applications in many areas of modern technology. The shape, size and composition of QDs are important structural parameters in determining the opto-electronic properties of the QDs. To produce QDs with a device applicable quantity, it is essential to understand the evolution process of the structural parameters of QDs. This project aims to use high spatial resolution scanning transmission electron microscopy and transmission electron microscopy together with image simulation techniques to conduct investigation of QD growth mechanism including the evolution of the shape, size and composition of the QDs.

F00105186

Dr GG Pereira

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Determination of free energies, phase diagrams and constitutive models by advanced theoretical techniques for novel interfacial polymer systems

Summary:

A variety of novel polymer systems, which have important technological applications, are studied by advanced theoretical techniques. Block copolymer melts self-assemble into patterns with length scales of roughly 10nm. If properly understood, they may be used as templates in nano-technologies for fabrication of devices much smaller than previously obtained. Polymer processing involves melting and solidification of the material and development of process-induced molecular orientation and crystalline structure. A suitable viscoelastic model will be developed to describe this. Simple theories suggest polymer blends can be tuned to produce continuous wetting transitions, in contrast to simple fluids. We will implement rigorous, realistic models to analyse this suggestion.

F00106340

Dr AJ Ruys

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Functionally graded ceramic composites

Summary:

Functionally graded materials (FGMs) are two-component composite materials that are gradually graded from one component to the other. They are ideal for severe operating conditions, eg., aerospace, nuclear, biomedical, and chemical processing industries. Two commercially significant types of FGM will be investigated. In each case, a novel fabrication process developed by the applicant will be used: (1) large continuous bulk ceramic-metal FGMs (very broad gradients) by thermoplastic freeze casting and impeller-dry-blending; and (2) glass-matrix nano-graded FGMs (nanoFGMs) by the nano-particle coating process. Such FGMs will open up new possibilities in a number of highly value-added specialised industries.

F00104925

Dr I Zarudi

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: A superfinishing technique for large wafers of brittle materials

Summary:

The research will develop an innovative technique for producing large wafers of brittle materials with a superfine surface finish. This technique will combine the advantages of ultra-precision grinding and polishing into a single operation. An effective superfinishing technique for the new generation of large-size wafers of brittle materials is essential because they are one of the most important materials for information technology, integrated circuit technology and fabrication of micro-machines.

2917 *COMMUNICATIONS TECHNOLOGIES*

F00106143

Dr SD Jackson

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F4 Engineering - Information Technology and Electrical Engineering

Title: New high power near-and mid-infrared fibre lasers employing cascaded Raman and double-clad fibre lasers

Summary:

This project will create a new class of mid-infrared fibre lasers designed for high efficiency and high power. New broadly tunable laser transitions will also be studied and applied to specific applications. These systems will utilise diode-pumped double-clad and cascaded Raman fibre laser technologies designed for optimised efficiency and functionality. Applications such as materials processing, molecular gas sensing and bodily tissue cutting will be explored using the new laser sources. I will also carry out spectroscopic studies into new doped glass materials for future fibre lasers. I will extend the output wavelength limit from high power fibre lasers to beyond 3 μ m. The experimental work will be supported by detailed theoretical modelling.

2918 *INTERDISCIPLINARY ENGINEERING*

F00105060

Mr IA Halatchev

Administering Institution: The University of Adelaide

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: The effect of mass transfer on fluid flow instabilities

Summary:

Diffusion driven mass transfer plays a key role in many industrial and biological applications. In the majority of cases it is important to be able to predict when the flow becomes turbulent. Understanding this process is necessary in order to design control strategies for the optimisation of mixing and minimisation of turbulent drag. This project will consider the question of the onset of turbulence in systems that exhibit interfacial mass transfer, diffusion across a membrane being one important example. This will result in a model to predict the onset of turbulence that can be used as a design aid.

F00104287

Mr C Lei

Administering Institution: James Cook University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F8 Engineering - Civil, Mechanical and Chemical

Title: Experimental and Numerical Modelling of Natural Convection Flow in a Reservoir Sidearm

Summary:

This project is aimed at enhancing our understanding of one of the principal mechanisms driving horizontal exchange flows in the near shore of reservoirs. Existing understanding of this mechanism has been restricted by the lack of experimental data and poor representation of numerical and analytical models. A combination of experimental, numerical and analytical methods will be applied to investigate the near shore circulation and, in particular, the role that internal waves play in the transient flow during diurnal forcing cycle. At the completion of this project, reliable experimental data and improved numerical and analytical models will be available.

3402 *APPLIED ECONOMICS*

F00106088

Dr JA Cameron

Administering Institution: Macquarie University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F7 Social Sciences

Title: **Governmentality and subjectivity in alternative economic enterprises.**

Summary:

The shift away from secure and lifelong employment to a regime of flexibility and innovation that increasingly individualises workers (and the unemployed) and demands that they act as entrepreneurs has been addressed by governmentally research. This proposed project is also concerned with economic government and subjects, but it examines the alternative practices developed in enterprises like cooperatives, not-for-profit ventures and non-banking financial innovations. Through case study and action-oriented research it attends to the emergence of new economic identities and modes of government, and documents the economic and political openings and possibilities that are created.

3601 *POLITICAL SCIENCE*

F00104289

Dr A Kent

Administering Institution: The Australian National University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F7 Social Sciences

Title: **International Law in China's Foreign Policy: Culture, Power and Globalisation.**

Summary:

The aim of the project is to write a book which examines the role of international law in Chinese foreign policy in the post-1978 modernisation era, thus filling a gap in the current literature. It will analyse China's international legal culture and traditional diplomacy and its role in the creation of international legal norms. It will contextualise China's position on major international legal principles and treaties against the background of its foreign policy and international environment and interpret its decisions through the prism of culture, power and globalisation. Related research includes my current work on China and global regulatory organisations.

F00102937

Dr CG Reus-Smit

Administering Institution: The University of Melbourne

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F7 Social Sciences (excluding Education, Psychology, Linguistics and Nursing)

Title: **Human rights and the transformation of world politics: rights politics, legitimate rule, and international political change**

Summary:

Rights claims played a central role in the international changes that occurred at Westphalia (1648), in the Age of Revolutions (1776-1848), with decolonization (1950s-1960s), and in the aftermath of the Cold War. Yet the literature on human rights and international relations has failed to consider the impact of rights politics over the long durée. This project will systematically examine and explain how, and to what extent, such politics has transformed the international system since the seventeenth century to the present era of globalization. It will generate a series of research articles, a book on human rights and the transformation of world politics, and a book on the conceptual and theoretical implications of the project for international relations theory.

3703 *ANTHROPOLOGY*

F00104173

Dr J Caton

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F7 Social Sciences

Title: **Modelling Digestive Strategies of Fossil Hominids.**

Summary:

Theories that human predecessors were carnivores, which date back to the first fossil discoveries, overlook evidence to the contrary from living hominids. In this project, for the first time, comparative data on diets, gastro-intestinal morphology and physiology of living hominids will be used to model digestive strategies of fossil species. As the resultant models are based on new data from apes and humans, they be more realistic and based in an evolutionary context. Models of fossil hominid digestive strategies will be used to re-assess the importance of meat-eating in human evolution, providing new insights into human diets and gut function.

F00102902

Dr T Reuter

Administering Institution: The University of Melbourne

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F5 Humanities

Title: **Hindu revivalism and religious conflict in Javanese society: an ethnographic investigation of changing identities and political aspirations in contemporary Indonesia.**

Summary:

Hinduism has been reclaiming parts of the Indonesian archipelago it once dominated for a millennium. Even Java, the island at the heart of what is now the world's largest Muslim nation, is witnessing mass conversions from Islam to Hinduism. Expectations of a new golden age among followers of this revival movement are an expression of utopian prophesies and political hopes more widely shared among contemporary Indonesians. An ethnographic study of the social dynamics, economics and politics of religious conversion in Java will appraise the implications of Hindu revival movements for Indonesia's fragile government. The research will identify the historical conditions under which this or other utopian movements may incite violent social conflict or serve a positive role in the creation or maintenance of a democratic society.

3801 *PSYCHOLOGY*

F00106038

Dr DM Alais

Administering Institution: Macquarie University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: Interactions between vision and audition in human sensory perception.

Summary:

How the brain integrates sensory information from different modalities to form coherent perceptions of the external environment is a challenging question in sensory and cognitive neuroscience. Neurophysiologically, sensory interactions have become well-known and understood over the last decade or so. Perceptually, however, complementary research is lacking. This project seeks to redress the imbalance, using audiovisual interactions as a paradigm. Psychophysical experiments will explore: (i) audiovisual interactions in perception (sound enhancing vision; vision enhancing hearing); (ii) audiovisual interactions in spatial attention. Neurophysiological evidence, plus very recent psychophysical findings of audiovisual interactions, suggest this will be a rich vein of research.

F00103520

Dr A Barnier

Administering Institution: The University of New South Wales

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: Forgetting Emotional Events from the Past: Extending Theories of Forgetting to Autobiographical Amnesia

Summary:

A complete account of autobiographical memory requires an understanding of how and what we forget from our past, as well as how and what we remember. To better understand the forgetting of emotional events from the past, this program will use the two major experimental paradigms of forgetting and will extend the existing theories of forgetting to autobiographical amnesia. The research will extend knowledge by comparing the impact of these paradigms on forgetting, comparing forgetting of emotional and unemotional events, evaluating whether these theories can explain emotion influences memories from the past, and developing a specific model of autobiographical amnesia.

F00105933

Dr C Clifford

Administering Institution: Macquarie University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: Testing a model of adaptive coding in human visual cortex

Summary:

The question of how our brains and those of other animals code sensory information is of fundamental importance to neuroscience research. Visual illusions offer valuable insight into the mechanism of perceptual coding. I have recently proposed an explanation of one such illusion, the tilt aftereffect, in terms of a functional model based on self-calibration and decorrelation in the neural representation of visual orientation. I believe these will prove to be general principles underlying the cortical coding of sensory information. Here, I propose a series of empirical tests of these principles applied to the perception of orientation, motion and colour.

3802 *LINGUISTICS*

F00105633

Prof R Dixon

Administering Institution: La Trobe University

Fellowship Type: Senior Research Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: Basic linguistic theory

Summary:

The project is to write the first comprehensive monograph on basic linguistic theory, the theoretical model which underpins almost all grammatical descriptions and most work on typological universals of language (eg asking whether all languages have relative clauses, and how these differ between languages). Part 1 will focus on methodology, modes of argumentation and the components of a linguistic description, while Part 2 will profile grammatical categories and construction types (such as negation, interrogatives, causatives). This work will constitute both a major contribution to linguistic theory and also a practical manual for pursuing linguistic description and typological generalisations concerning the nature of human language.

F00105978

Dr M Tabain

Administering Institution: Macquarie University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: The role of perception in speech production: a comparison between Australian Aboriginal languages and English.

Summary:

Aboriginal languages, such as Pitjantjatjara and Yindjibarndi, differ greatly from English in the number and type of consonants they use. It is believed that the number and type of consonants in the inventory for a language determines the amount of variability in their production. Moreover, it is believed that the variability in production of sounds is constrained by the demands of the hearer, so that "ease of articulation" for the speaker competes with "intelligibility of the message" for the hearer. The present study seeks both to compare the degree of variability in production across the languages examined, and to assess any correspondence with analyses of consonant perception for each language.

3803 *COGNITIVE SCIENCE*

F00105928

Dr K Croot

Administering Institution: Macquarie University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F9 Social Sciences (Education, Psychology, Linguistics and Nursing)

Title: Is there a syllabary containing stored articulatory plans for speech production?

Summary:

The first aim of this project is to investigate whether normal speakers access a syllabary containing stored articulatory plans for high-frequency syllables, as the means by which they translate stored linguistic representations into motor commands for speech. The second aim is to establish whether people with the acquired speech disorder apraxia of speech show evidence of impaired access to articulatory plans in such a syllabary (Whiteside & Varley, 1998). The results will contribute to the development of an influential model of speech production (Levelt, Roelofs & Meyer, 1999), and will inform our understanding of a widespread but poorly understood speech disorder.

F00105756

Dr P Gerrans

Administering Institution: Monash University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: Theoretical Foundations of Cognitive Neuropsychiatry. Understanding Delusional Disorders

Summary:

The project examines the conceptual foundations of cognitive neuropsychiatry, the integrative study of the relation between cognitive and brain processes damaged or dysfunctional in psychiatric disorders. The focus is on the use of computational models of mental function to explain a variety of delusions including misidentification symbols and schizophrenia.

F00105810

Dr B Neil

Administering Institution: Australian Catholic University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: **Popes and Martyrs: The Politics of Hagiography in Ninth-Century Rome**

Summary:

The study aims to place the Commemoration of Pope Martin I (649-653) in the political and historical context of Anastasius Bibliothecarius' translation corpus. This work, like others in Anastasius' substantial hagiographic corpus, was used in the cause of promoting papal primacy in the late-ninth century. It provides a window into the role of hagiography and the concomitant development of saints' cults in the complex rivalries which existed between Rome, Francia and Constantinople. The project will result in a monograph with an edited Latin text, translation and extended introduction and historical commentary.

F00105195

Dr LE Semler

Administering Institution: The University of Sydney

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F5 Humanities

Title: **Renaissance Grotesque: An historical analysis of sixteenth- and seventeenth-century English literary and visual definitions of the grotesque**

Summary:

This is a research project to determine the historical meanings of the grotesque, grottesco and antick-work in English literary and visual arts between 1550-1660. It involves analysis of visual arts and diverse literary genres including travel writings, religious sectarian and civil war literature, women's writing and romance and history in the Renaissance. It aims to contribute to contemporary debates regarding these genres and to provide a history of the grotesque in England.

4203 *CULTURAL STUDIES*

F00104901

Prof D Chakrabarty

Administering Institution: The Australian National University

Fellowship Type: Senior Research Fellowship

Panel: F5 Humanities

Title: **Everyday Consumption of Cultural Practice in India: A Contemporary History**

Summary:

This project will research the recent cultural history of marketing and consumption of everyday objects in India, to investigate how a consumerist capitalist culture emerges in the context of third-world nation, and to see if contemporary globalization of capitalism really threatens human cultural diversity. This is a pioneering attempt in the social sciences to study contemporary consumption in a third-world context. Globalisation studies usually focus on economic liberalization, the media and cultural tourism. By blending historical, ethnographical, cultural studies and market-research approaches, the project will expand the frontiers of cultural analyses and globalization theories. The outcome of this project will be a major book.

F00104800

Dr SE Murray

Administering Institution: The University of Queensland

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F7 Social Sciences (excluding Education, Psychology, Linguistics and Nursing)

Title: **Cross-Media Content Streaming: Rationale and Reality in Converged Media Environments.**

Summary:

The project constructs a framework for critically analysing the contemporary media business practice of content streaming, whereby content originated in one format is repurposed in new formats. While the dominance of such 'synergistic' policies amongst highly-converged media multinationals has received extensive commentary from management theorists, its significance in political, cultural and consumer terms has gone largely unremarked. Utilising an extensive body of contemporary press coverage, industry interviewing and established media studies methodologies, the project interrogates three specific debates generated by content streaming policy and practice: threats to the diversity and critical quality of media information; ramifications for Australia as a producer of media content; and potential reconfigurations of globalised media ecologies.

F00105468

Dr B Rooney

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: A materialist feminist study of Australian Writers as public intellectuals

Summary:

My project compares texts by and about four contemporary Australian Writers who have acted as public intellectuals. My focus on the often controversial role writers have played in public debate in Australia will illuminate relations between literary and public cultures. Conducting a materialist feminist analysis of the forces shaping public controversy and literary reputation, this comparative case study will address the role and the future of the public intellectual in present Australian society.

F00104426

Mr M Thomas

Administering Institution: University of Technology, Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: Meeting Jimmie Barker: Genealogies of cross-cultural encounter

Summary:

An 'era of return' has opened in Aboriginal society. Ethnographic data is returning to communities and being re-deployed. Early anthropology, like the writings of R. H. Mathews (1841-1918) is central to many native title claims. Yet the context for such research is inadequately understood. The 1968 meeting between Mathews' grand-daughter in law, Janet Mathews, and Mararwari informant, Jimmie Barker (1900-72) resulted in Barker recording 150 hours of remarkable testimony that is now used around Brewarrina to facilitate cultural understandings. The project engages with this meeting to produce a genealogy of cross-cultural encounter, acknowledging its creative possibilities, limitations and political importance.

4301 *HISTORICAL STUDIES*

F00103847

Dr D Cahill

Administering Institution: The University of New South Wales

Fellowship Type: Senior Research Fellowship

Panel: F5 Humanities

Title: **Territoriality and Local Power, Gendered and Ritual Space: The Southern Andes, 1532-1825**

Summary:

In four Andean regions under Spanish rule (1532-1825) to evaluate the interrelationship between land tenure, territoriality, and local power, by infusing the analysis with notions of gendered and ritual space, in order to develop models of gendered landscape and land alienation. It is the first non-local study of its type; the first long-term study of the South Andean chiefdoms; the first historical model of gendered landscape; the first post-1532 study to use Incan spatial principles; the first study of female chieftains; the first to map such processes over 300 years. Its concrete outcomes will be three books and several articles.

F00102913

Dr ME Cassidy-Welch

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: **Cultures of incarceration: prisons and imprisonment in medieval Europe, 1100-1500**

Summary:

The aim of this project is to explore varieties, understandings and experiences of imprisonment in Europe from 1100-1500. The project will be the first cultural history of incarceration during the medieval period and is significant in formulating a new means of understanding the diverse prison 'systems' of the Middle Ages. The project will be based on original research into royal, episcopal, inquisitorial, monastic and debtors' prisons, and will investigate captivity narratives, hostage crises, political prisoners and representations of incarceration by prisoners themselves. A major and innovative monograph on medieval imprisonment and three scholarly articles will result from the project.

F00103065

Dr J Evans

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: **The Rule of Law in the colonial encounter**

Summary:

This research challenges established jurisprudential understandings according to which the Rule of Law emerged as an internal product of European historical processes. Demonstrating the reciprocity of the colonial encounter, it highlights the contribution of events in British colonies to the historical development of the Rule of Law by examining four local case studies wherein the need to contain the colonised's resistance saw its partial or complete suspension. The project establishes important bridges between traditional Marxist and recent postcolonial critiques of imperialism while its interdisciplinary and comparative approach redresses important absences in the fields of History and Law.

F00105805

Dr W Mayer

Administering Institution: Australian Catholic University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F5 Humanities

Title: **John Chrysostom: a Revisionist Approach to a Prominent Figure in Late Antiquity**

Summary:

This project builds on internationally recognised research conducted over the past nine years which has shown that many of the long-standing assumptions regarding John's motivations, attitudes and character, as perpetuated in the latest biographies, rest on shaky grounds. In addition, all of the biographies to date take an old-fashioned chronological approach. Using as its basis cutting edge research, this project will apply a non-chronological approach, with the aim of arriving at an improved, more reliable understanding of this significant figure. At the end, a new profile of John Chrysostom, John: Bishop of Constantinople, Priest of Antioch, will be produced.

F00106153

Dr C Pybus

Administering Institution: University of Tasmania

Fellowship Type: Senior Research Fellowship

Panel: F5 Humanities

Title: Inter-colonial transportation and race relations in the British Empire in Age of Reform

Summary:

This project breaks new ground in the study penal transportation, focussing on inter-colonial transportation in the British Empire during a period of political unrest and reform. It will make a major contribution to a paradigm shift in penal history and race relations in colonial Australia and a re-conceptualisation of contemporary politics of identity. The project will also make a conceptual advance in understanding of the mechanisms of political control in the colonies, and the role of unfree labour after the abolition of slavery. Four separate book length monographs and a edited colleciton of convict narratives will result

4302 *ARCHAEOLOGY AND PREHISTORY*

F00103626

Dr P Allison

Administering Institution: The Australian National University

Fellowship Type: Australian Research Fellowship/Queen Elizabeth II Fellowship

Panel: F5 Humanities

Title: **Engendering Roman Spaces: A Feminist Approach to Interpreting the Material Culture Remains of Roman Houses, Military Forts and public Spaces.**

Summary:

The objective of this project is to produce more engendered perspectives of Roman society through more holistic investigations of its archaeological remains. It will complement recent feminist approaches to Roman textual and art-historical evidence with more informed understandings of gender relationships within Roman spaces. In this it will contribute to more engendered perspectives of the history of western civilisation.

F00105225

Mr GR Clark

Administering Institution: The Australian National University

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: **Austronesian Expansion and the Colonisation of Western Micronesia.**

Summary:

The project examines the structure of Austronesian expansion in the Western Pacific through the archaeological study of the colonisation phase in the Belau Islands, Micronesia. These islands are at the frontier of the major Austronesian diaspora (ca 4000 years ago) and the excavation of settlement era sites will clarify the origin, timing and nature of population movement east of the Indo-Malaysian archipelago. The project will investigate the colonising strategy by dating early occupation sites and analysing archaeological materials, particularly pottery.

F00103174

Dr H Yoshida

Administering Institution: The University of Melbourne

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F3 Earth Sciences

Title: Optical dating of ancient rock art in western Arnhem Land, Northern Territory

Summary:

Rock art is an important behavioural hallmark of fully modern humans. Western Arnhem Land in northern Australia boasts one of the world's greatest and richest concentrations of Indigenous rock art, but the age of this spectacular rock art sequence is poorly known. Optical dating offers a solution to this impasse. This project proposes to construct a numerical-age chronology for western Arnhem Land from optical dating of ancient mud-wasp nests preserved over and under rock paintings. The resulting chronologies will provide a long-awaited temporal link to other archaeological evidence in the region and to rock art elsewhere in Australia and overseas.

4401 *PHILOSOPHY*

F00105141

Dr S Lumsden

Administering Institution: The University of Sydney

Fellowship Type: Australian Postdoctoral Research Fellowship

Panel: F5 Humanities

Title: *Self-consciousness and the Critique of the Subject*

Summary:

This project addresses philosophical understandings of subjectivity. It argues that a reconsideration of the model subjectivity in German idealism can provide a new ground for exchange between one of the major divisions in philosophy: German idealism and poststructuralism. Poststructuralism has forged its identity by opposition to what it takes as the erroneous model of subjectivity in German idealism. This project, by demonstrating that central to the thinking of German idealism will open the pathways for the reassessment of both subjectivity and the relation of poststructuralism to German idealism.
