# Australian Research Council
# *Federation Fellowships*
# 2006

## PROFESSOR JOHN BRAITHWAITE

Project*: Restorative justice and responsive governance: Fresh challenges, new theory, global networks*

Current institution: The Australian National University

Host institution: The Australian National University

Primary research field: Sociology

Professor John Braithwaite is one of Australia's most distinguished social scientists, internationally recognised for his contributions to sociology, including inventing the concept and field of responsive regulation. He is also a leading theorist and catalyst of research on restorative justice.

Professor Braithwaite will analyse governance strategies from diverse contexts, such as war, in search of general keys to effectiveness and justice. War causes human suffering and threatens the health and education of children. It sets back economies and encourages transnational crime in the trafficking of people, guns and drugs, money laundering, and terrorism.

Professor Braithwaite aims to provide fresh insights from the successes and failures of peace building in the Pacific and Asia. He will also investigate the effectiveness of new strategies for improving the performance of our health system, strengthening the knowledge economy, improving competition and preventing crime. His work will help Australia to become the dominant locus of research on restorative and responsive strategies.

Professor Braithwaite is Director of the Centre for Competition and Consumer Policy and Chair of the Regulatory Institutions Network (RegNet), which brings together some of the most distinguished international and Australian scholars to work on the critical domains of regulation.

Professor Braithwaite completed his PhD in Sociology at The University of Queensland. He has been awarded several prestigious international prizes, such as the *Sutherland Award* from the American Society of Criminology (2002), the *Kalven Prize* from the US Law and Society Association (2004) and the *Prix Emile Durkheim* from the International Society of Criminology (2005).

This is his second *Federation Fellowship*.

## DR PAUL BURN

Project*: Dendritic organic semiconductors*

Current institution: University of Oxford

Host institution: The University of Queensland

Primary research field: Organic chemistry

Dr Paul Burn was awarded a Dow Research Fellowship at Christ's College, Cambridge, in 1989 to work on conjugated polymers for light-emitting diodes (PLEDS). Since then, he has built a world-class research capability in organic semiconductors for opto-electronics at Oxford, in particular using light-emitting dendrimer materials for flat panel display devices.

Dr Burn intends to develop a world-class initiative in organic semiconductors by developing new dendritic materials and gaining a fundamental understanding of how these materials work in opto-electronic devices.

The aim of his research is to establish organic semiconductors as the materials of choice for applications in flat panel displays, lasers, solar cells, sensors and plastic electronics.

The perceived advantages of organic semiconductor devices over conventional inorganic semiconductors include ease of processing, production of large area devices and simple tuning to achieve appropriate opto-electronic properties.

Dr Burn will create new methods for the preparation of dendrimers and poly-dendrimers, develop a logical design rationale for dendrimer-based light-emitting diodes and, subsequently, under optimised production methods, produce prototype devices for evaluation.

His research program will complement current research on polymer materials by key groups within Australia and establish a strong international team in one of the fastest growing high-impact fields of organic chemistry.

Dr Burn completed a PhD in Organic Chemistry at The University of Sydney and has been Lecturer and Tutorial Fellow in Chemistry at Oxford since 1992. He is a College member of the UK Engineering and Physical Sciences Research Council and an adviser to Cambridge Display Technology Ltd.

Dr Burn's research on PLEDS and dendrimer materials has entered the marketplace through strong collaborations with established international firms and a spin-off company in the UK. He is co-author on many patent applications in materials and device structures and has numerous seminal publications in the field of organic semiconductors.

## PROFESSOR MARK BURRY

Project*: Complex architecture and convergent design*

Current institution: RMIT University

Host institution: RMIT University

Primary research field: Architecture and urban environment

Professor Mark Burry is a Professor of Architecture and Design and Director of RMIT's state-of-the-art Spatial Information Architecture Laboratory (SIAL).

Professor Burry founded SIAL in 2001. An interdisciplinary research environment dedicated to almost all aspects of contemporary design activity, the Laboratory is the first of its kind in Australasia and one of very few in the world.

SIAL focuses on design research and teaching with advanced computer applications and the rapid prototyping of ideas. It has a design-practice emphasis and acts as a creative think-tank accessible to local and international practices.

In 2004, SIAL achieved international recognition when it was selected as one of six *Brain Cells* for the Avant Garde A2 Pavilion in the Architecture Biennale Beijing.

Professor Burry has added considerable value to international leadership in embedded practice by working as a Consultant Architect to Gaudi's Sagrada Familia Church in Barcelona since 1979 and has contributed to its paradoxical pre-eminence as an exemplar of advanced approaches to contemporary design and construction.

Professor Burry's research program will focus on the lessons learned from 26 years of working on the completion of Sagrada Familia Church during a time of unprecedented change in architectural practice. He will work on the computer modelling and dynamic simulation of complex design and construction problems, and methods for cross-disciplinary and distributed team collaboration.

He plans to produce four books to consolidate architectural scholarship on the transition from traditional to digitally assisted architectural design and practice, and to push architectural, manufacturing and building technology transfer and innovation in new directions.

Professor Burry has worked as a design research collaborator to dECOi in Paris since 1996, and Gehry Partners in Los Angeles since 1995. He has received several prestigious awards, including the *Commonwealth Heads of Architecture Schools Association Award* (1995) and the *Committee for Melbourne Achiever Award* (2004).

Professor Burry is a member of the Advisory Board for Gehry Technology, Visiting Professor at Liverpool University (UK) and MIT (USA), and Honorary Professor at Deakin University.

## PROFESSOR DAVID FAIRLIE

Project*: Chemical mimics of bioactive protein surfaces*

Current institution: The University of Queensland

Host institution: The University of Queensland

Primary research field: Organic chemistry

Professor David Fairlie is an ARC *Australian Professorial Fellow* at The University of Queensland, where he is a Group Leader in chemistry and human therapies at the Institute of Molecular Bioscience.

Professor Fairlie has made a significant contribution to medicinal/organic/biological chemistry by producing two major advances at the chemistry/biology interface:

- pattern recognition in protein-protein interactions, resulting in unique findings that short β-strands, α-helices and β-turns are discrete, universal, recognition shapes for pharmaceutically important classes of proteins, suggesting new generic approaches to drugs, and
- mimicking these shapes with small molecules, including among the first β-strand and α-helix mimics.

Professor Fairlie's research program will focus on proteins and their uses in medicine, science and industry. The aim is to develop new chemical technology for creating simpler, smaller, cheaper, more stable and more 'bioavailable' molecules than currently available, which can execute selected functions of proteins.

The approach will involve devising stable new molecular shapes to mimic structural components of proteins (helices, turns, strands, and combinations), and using them as tools to interrogate biological systems and explore prospective applications as new pharmaceuticals, diagnostics, vaccines and nanomaterials.

Professor Fairlie completed his PhD in Chemistry at The University of New South Wales. He has led large interdisciplinary research programs conducting multi-million dollar research into anti-viral drugs, phospholipases A2, anti-inflammatory drugs and complement-based drugs.

Professor Fairlie's research group spans researchers from the universities of Adelaide, Melbourne, Queensland, Sydney and New South Wales, Monash University, Griffith University, Queensland University of Technology and overseas universities.

PROFESSOR CHRISTOPHER GOODNOW

Project*: Discovering genes and mechanisms regulating immune responses*

Current institution: The Australian National University

Host institution: The Australian National University

Primary research field: Genetics

Professor Christopher Goodnow is Professor of Immunology and Genetics, Director of The Australian Phenomics Facility and Head of the Medical Genome Centre at the John Curtin School of Medical Research at The Australian National University.

He is internationally renowned for ground-breaking research to understand the behaviour of the immune system and the control of antibody responses.

Professor Goodnow aims to build an international Immunity and Infection Genomics Consortium in Australia to tackle three fundamental, longstanding questions about the mammalian immune system:

- How does the system learn not to attack self-components?
- How does it enhance recall responses to vaccines?
- Why does it fail to eliminate formidable foreign microbes such as *Mycobacteria* and *Plasmodia*?

He will build on Australia's research strengths in the field of immunity and infection, and create new knowledge and resources to improve human and animal health through vaccines, pharmaceuticals and public health policy.

Professor Goodnow has sought to translate his discoveries and expertise into public health and industrial outcomes, and founded a company, Illumina, aimed at developing high-throughput, low-cost genotyping necessary for human epidemiology, pharmacogenomics and marker-assisted breeding in agriculture.

Professor Goodnow completed his PhD in Immunology at The University of Sydney. He is a Fellow of the Australian Academy of Science and has received numerous prizes and awards, including the Commonwealth Health Minister's *Award for Excellence in Health and Medical Research* (2005) for his work in molecular genetics.

Professor Goodnow is on the editorial boards of leading journals within his discipline such as *The Journal of Experimental Medicine* and *Immunity.*

PROFESSOR MARTIN GREEN

Project*: Nanostructured silicon-based tandem solar cells*

Current institution: The University of New South Wales

Host institution: The University of New South Wales

Primary research field: Electrical and electronic engineering

Professor Martin Green is the Executive Research Director of the ARC Centre of Excellence for Advanced Silicon Photovoltaics and Photonics at The University of New South Wales.

Photovoltaics, the direct conversion of sunlight into electricity using solar cells, is a promising option suggested for helping to meet the world's future energy needs in a sustainable manner. Solar cells are a rapidly growing energy source.

Professor Green aims to develop a new generation of low-cost silicon solar cell that can be expected to significantly reduce the costs of generating electricity from sunlight, help to create new opportunities for Australian industry and contribute to a cleaner environment.

Professor Green founded the Photovoltaic Laboratory at The University of New South Wales in the mid-1970s. Now the ARC Centre of Excellence for Advanced Silicon Photovoltaics and Photonics, it is internationally recognised as one of the premier photovoltaic research institutions.

He is recognised as a world leader in photovoltaic research and much of his research has resulted in successful patents being licensed to international companies.

Professor Green is also the Research Director of CSG Solar Pty Ltd, a solar cell manufacturing company formed through commercialisation of The University of New South Wales photovoltaic research.

Professor Green completed his PhD in Engineering Physics at McMaster University, Canada. He has received numerous national and international scientific awards recognising the exceptional contributions he has made to his field of research.

These include the *Australia Prize* (1999), the inaugural *Medal of Engineering Excellence* (2000), *Right Livelihood Award* (2002), *Karl W Boer Solar Energy Medal of Merit* (2003) and *World Technology Award for Energy* (2004).

This is his second *Federation Fellowship*.

## PROFESSOR PAUL HADDAD

Project*: Separation science based on nanoparticle-coated monolithic scaffold stationary phases*

Current institution: University of Tasmania

Host institution: University of Tasmania

Primary research field: Analytical chemistry

Professor Paul Haddad is an ARC *Australian Professorial Fellow*, the Research Leader of the University of Tasmania node of the Australian Centre for Research on Separation Science and founder of the Australian Research Network for Analytical Science. He is a former Dean of the Faculty of Science and Engineering at the University of Tasmania.

Through his research program, Professor Haddad will aim to generate fundamental advances in separation science by developing new stationary phases and separation technologies suitable for the analysis of complex samples that cannot be addressed by current methods.

These technologies will have wide applications, including in pre- and post-blast identification of explosives in counter-terrorism; environmental, clinical, and forensic analysis; energy generation; and foods. His work will aim to generate new intellectual property, with extremely high commercial potential on a worldwide scale and the possibility of considerable direct financial returns to Australia.

Professor Haddad completed his PhD in Analytical Chemistry at The University of New South Wales. He is a Fellow of the Australian Academy of Science, the Academy of Technological Sciences and Engineering, the Royal Australian Chemical Institute and the Royal Society of Chemistry.

Professor Haddad is the recipient of several awards, including the *AJP Martin Gold Medal* from the Chromatographic Society (2002) and the *Award for Analytical Separation Science* from the Royal Society of Chemistry (2003).

He is editor of the *Journal of Chromatography A* and contributing editor to *Trends in Analytical Chemistry.* He is also a member of the editorial boards of a number of international analytical and chromatographic journals:

- *Electrophoresis*
- *Chromatographia*
- *The Analyst*
- *International Journal of Environmental Analytical Chemistry*
- *Analytical Letters*
- *Trends in Chromatography*
- *Current Analytical Chemistry*
- *Australian Journal of Chemistry.*

## PROFESSOR PETER HALL

Project*: Nonparametric statistical methods—new directions, theory and applications*

Current institution: The Australian National University

Host institution: The University of Melbourne

Primary research field: Statistics

Professor Peter Hall is an ARC *Australian Professorial Fellow* and Professor of Statistics at the Centre for Mathematics and its Applications at The Australian National University.

By developing a leading-edge research program in modern statistics, Professor Hall aims to produce a new generation of world-class Australian statistical scientists.

The availability of modern computer technology has had a dramatic impact on statistical methods and thinking. The nature and volume of data that are collected have changed and continuously require new nonparametric statistical techniques to deal with increasing complexity.

Professor Hall envisages several potential applications for his research based on new techniques in critical areas like economics, defence, health science, engineering, astronomy and image analysis.

Professor Hall completed his PhD in Probability Theory at Oxford University. He is a Fellow of the Australian Academy of Science, the American Statistical Society and the Royal Society of London.

He has received numerous prestigious international awards and honours in recognition of his outstanding contributions to his field of research.

These include the *American Statistical Association Award* (2002), *Centennial Professorship,* London School of Economics (2000-02) and honorary doctorates from the Université Catholique de Louvain (1997) and the University of Glasgow (2005). He has also received two ARC *Australian Professorial Fellowships*, in 2002 and 2005.

Professor Hall has served on several editorial boards including:

- *Annals of Statistics*
- *Australian and New Zealand Journal of Statistics*
- *Bernoulli*
- *Economic Theory*
- *Journal of Statistical Planning and Inference*
- *Probability Theory and Related Fields*.

PROFESSOR TERENCE HUGHES

Project*: Science for resilience of coral reef systems*

Current institution: James Cook University

Host institution: James Cook University

Primary research field: Ecology and evolution

Professor Terence Hughes is one of the world's leading coral reef ecologists. He is Research Director of the ARC Centre of Excellence for Coral Reef Biodiversity and previously held a Personal Chair in the School of Marine Biology and Aquaculture at James Cook University.

The ARC Centre of Excellence, along with the Intergovernmental Oceanographic Commission and the National Oceanic and Atmospheric Administration, is part of *The World Bank Global Coral Targeted Research Program*.

Coral reef biology is a field of growing importance, with many of the world's coral reef systems being recognised as under threat from climate change, overfishing and other human activities. Professor Hughes's primary goal is to quantify the processes underlying the management of coral reef biodiversity and the goods and services they provide to human societies.

The coral reefs of Australia, particularly the Great Barrier Reef, Ningaloo Reef and Lord Howe Island World Heritage Area, are Australian icons of great economic, social and aesthetic value. Professor Hughes and his collaborators will be the foremost providers of the scientific expertise that underpins the management of Australian reefs, which is vital for the sustainable use of biodiversity goods and services.

Professor Hughes completed his PhD in Ecology and Evolution at Johns Hopkins University. He is a Fellow of the Australian Academy of Science and a recipient of major scientific awards such as the *Exceptional Service Award* from the International Society for Reef Studies (2000) and the *Silver Jubilee Prize for Excellence* from the Australian Marine Science Association (2004).

Professor Hughes is a consultant and technical advisor on environmental management and policy issues for the tourism and fishing industries, international and Australian governments, and agencies and institutions such as the International Society for Reef Studies, the International Centre for Living Aquatic Resources Management, the Great Barrier Reef Marine Park Authority, AusAID, the Department of Education, Science and Training and the Department of Environment and Heritage.

He has served on several editorial and advisory boards, including those of *Coral Reefs, Israel Journal of Zoology* and *Ecology and Society*.

This is Professor Hughes's second *Federation Fellowship*.

PROFESSOR DAVID KAROLY

Project*: Improving understanding of climate change and its impacts in Australia*

Current institution: University of Oklahoma

Host institution: The University of Melbourne

Primary research field: Atmospheric sciences

Professor David Karoly is one of the world's foremost authorities on global climate and climate variability and, in particular, the dynamics of the large-scale atmospheric circulation in the Southern Hemisphere and its variability.

He holds the Williams Chair of Meteorology in the School of Meteorology at the University of Oklahoma and previously held appointments as a Professor of Meteorology, Head of School of Mathematical Sciences and Director of the Cooperative Research Centre for Southern Hemisphere Meteorology, Monash University.

Climate change is an important scientific, economic, environmental and social issue for Australia and the world. Professor Karoly aims to develop improved projections for climate changes in Australia through evaluation of the performance climate models in simulating global and regional climate variation over the past century and quantifying the contributions of different climate-forcing factors, such as greenhouse gases and stratospheric ozone depletion.

Professor Karoly will collaborate with the CSIRO and the Bureau of Meteorology to improve the understanding of the causes and impacts of Australian climate variability. Their work will help to build a capability for modelling new Australian climate scenarios and investigate the impacts on Australia of stratospheric ozone depletion.

Professor Karoly's research will assist policymakers considering issues such as emission reductions and adaptation to climate change caused by greenhouse gases.

Professor Karoly completed his PhD in Meteorology at The University of Reading. He is a member of several international committees, including the World Meteorological Organization Expert Team on Climate Change Detection, Data and Indices; the US National Research Council Climate Research Committee; and the Council of the American Meteorological Society.

He has received several prestigious awards for his research on climate change, including the *Meisinger Award* from the American Meteorological Society (1993) and the *Norbert Gerbier-Mumm Prize* from the World Meteorological Organization (1998).

## PROFESSOR BENEDICT KIERNAN

Project*: Cambodia—place, people and politics: Environmental, economic, cultural, political and regional history since earliest times*

Current institution: Yale University

Host institution: The University of Sydney

Primary research field: Historical studies

Professor Benedict Kiernan is an international authority on the modern history of Cambodia and has an internationally acclaimed record of research into genocide and its history in Africa, Asia and Europe.

He is the A. Whitney Griswold Professor of History at Yale University, Director of the Genocide Studies Program (GSP) and the founding Director of the Cambodian Genocide Program (CGP), also at Yale. Under his leadership, the GSP and the CGP have gained an international reputation for excellence.

The CGP is financially supported by the governments of Australia, the Netherlands, and the United States and by several foundations. Professor Kiernan was instrumental in unearthing and disclosing documents attesting to genocidal crimes of the Khmer Rouge regime. His research has been an important resource for scholars, the United Nations, and victims and prosecutors of crimes against humanity.

Professor Kiernan aims to produce a comprehensive history of the long-term interactions between the people of Cambodia, their land and their neighbours. His research will generate international access to newly emerging knowledge from various historical periods and draw on new perspectives from various disciplines, including archaeology, climatology and international criminal justice.

Based on the unique longitudinal series of indigenous Khmer sources and latest findings from a range of disciplines, Professor Kiernan will generate a coherent model for the application of environmental, comparative and word history to other Southeast Asian countries. The results will have a significant impact on Australian, regional and global study of Southeast Asia.

Professor Kiernan completed his PhD in Southeast Asian History at Monash University. He is a member of several editorial boards, including those of *Critical Asian Studies*, *Human Rights Review*, *Journal of Human Rights*, *Journal of Genocide Research* and *Zeitschrift für Genozidforschung*.

Professor Kiernan has received the *Critical Asian Studies Prize* (2002) for his edited anthology *Conflict and Change in Cambodia.* He also designed the award-winning CGP web site.

## PROFESSOR TIMOTHY LINDSEY

Project*: Islam and modernity: Syari'ah, terrorism and governance in South-East Asia*

Current institution: The University of Melbourne

Host institution: The University of Melbourne

Primary research field: Justice and law enforcement

Professor Timothy Lindsey is a Professor of Asian Law at The University of Melbourne and Director of the Asian Law Centre (ALC), which he co-founded in 2004. He is also Deputy Director of the Centre for the Study of Contemporary Islam.

Under his leadership, the ALC has become one of the world's largest academic centres for the study of Asian legal systems and established an international reputation for excellence in this field.

Professor Lindsey is a leading scholar of Asian legal systems and Indonesian Law. He has created a new body of literature on Indonesian legal systems, including *syari'ah* (Islamic Law).

Terrorism in Southeast Asia responds to challenges that western-derived modernity poses for Islam. These challenges include market economies, democracy and nation states. Professor Lindsey will examine the different responses to these challenges through research in regional Muslim communities, institution building, mentoring young scholars and community engagement in the Southeast Asian region.

He aims to achieve a better understanding of Islam and terrorism in Southeast Asia and thereby strengthen Australia's capacity to navigate our regional relationships. Professor Lindsey will address an area of critical national significance, concentrating on three interconnected research themes:

- Islam and the challenges of modernity
- mapping new approaches to "Islamic" governance, and
- militancy and "syari'ah".

Professor Lindsey completed his PhD in Philosophy at The University of Melbourne.

He is a member of several editorial and advisory boards, including the Foreign Affairs Council, the Board of the Australia-Indonesia Institute, the International Board of the Asia Society, the Asian Studies Association of Australia, *Southeast Asia Publication Series* and *Employment Law Asia.*

He is co-founder and executive editor of the *Australian Journal of Asian Law*.

## ASSOCIATE PROFESSOR IVAN MARUSIC

Project*: Wall turbulence drag: Physical mechanisms and practicable control strategies*

Current institution: University of Minnesota

Host institution: The University of Melbourne

Primary research field: Interdisciplinary engineering

Professor Ivan Marusic is an Associate Professor at the Department of Aerospace Engineering and Mechanics and Director of Graduate Studies at the University of Minnesota.

He has made significant contributions to fluid mechanics via theoretical and experimental descriptions of turbulent flow using novel instrumentation and practical methods.

Professor Marusic will investigate the physical mechanisms that sustain wall turbulence and develop predictive tools for turbulent flows, particularly under high Reynolds number conditions. His work is expected to result in the use of efficient control strategies to reduce skin-friction drag in turbulent flows.

He will also develop techniques for simultaneous quantitative measurement of non-linear dynamic interactions of fluid motions across the full range of spatial and temporal scales. These techniques will allow observation of turbulent flows as they evolve at gas-solid and water-solid interfaces.

Professor Marusic completed his PhD in Fluid Mechanics at The University of Melbourne. During his postdoctoral work, he was a principal designer of the High Reynolds Number Wind Tunnel at The University of Melbourne, a world-class facility for research on turbulent boundary layers in many engineering applications.

Professor Marusic has maintained strong collaborations with laboratories in Melbourne, Cambridge, Utah, Edinburgh and Zurich and is a member of the planning committee for the Centre for International Cooperation in Long Pipe Experiments to be located in Bologna, Italy.

He has won several awards, including the *CAREER Award* of the National Science Foundation (2000), the *McKnight Land-Grant Professorship* of the University of Minnesota (2000) and an early career Fellowship from the Packard Foundation (2001).

## PROFESSOR GEOFFREY MCFADDEN

Project*: Drug targets in malaria parasites*

Current institution: The University of Melbourne

Host institution: The University of Melbourne

Primary research field: Medical microbiology

Professor Geoffrey McFadden, an ARC *Australian Professorial Fellow* in the School of Botany at The University of Melbourne, is one of the world's leading authorities in malaria research. He and his research group were first to identify a relict chloroplast in malaria parasites and revolutionise the understanding of the parasite's evolution.

Malaria is a major global health problem, with an estimated five million people dying from the disease every year. Existing therapeutic drugs are no longer as useful in treating malaria because, over the years, the parasites have become resistant to them.

Professor McFadden will create Australia's first malaria mosquito facility in Melbourne to redress the existing gap in Australia's capacity to study the parasite in the mosquito phase of its life cycle. The new facility will also be of value in studying insect-borne viruses and developing new and sophisticated gene targeting technologies for malaria parasite research.

The anticipated critical new knowledge of the basic biology of the malaria parasite as a result of Professor McFadden's research program will contribute to the efficient development of new anti-malarial drugs.

Professor McFadden completed his PhD in Cell Biology at The University of Melbourne and set up the ARC/NHMRC Research Network for Parasitology, which unifies 60 parasitology laboratories from 26 Australian research institutions.

He is President of the International Society of Evolutionary Protistology and a Fellow of the Australian Academy of Science.

Professor McFadden has received several awards recognising his outstanding contribution to his field of research. These include the *David Syme Medal* (2001), *Woodward Medal for Excellence in Science and Technology* (2003) and the *Howard Hughes Medical Institute International Scholar's Award* (2000 and 2005).

Professor McFadden has served on several editorial boards, including those of *Biology Image Library*, *Today's Life Sciences*, and the *European Journal of Phycology*.

He is an associate editor for *Molecular Biology & Evolution*.

## PROFESSOR KEITH NUGENT

Project*: Coherent x-ray science and biophysics*

Current institution: The University of Melbourne

Host institution: The University of Melbourne

Primary research field: Physical sciences

Professor Keith Nugent is an internationally recognised leader in x-ray imaging, optics and x-ray lasers. He is Director of the ARC Centre of Excellence for Coherent X-ray Science at The University of Melbourne and Director of Iatia Ltd, an ASX-listed company formed to commercialise outcomes from the Centre's work.

Professor Nugent aims to develop the x-ray free electron laser (X-FEL) to resolve structures of non-crystalline biological materials such as membrane proteins. The research will build on the adaptation of his phase measurement methods to reciprocal space, his earlier post-doctoral research in x-ray lasers and recent advances in coherent diffraction imaging.

The aim is to develop the basis for imaging a single biological molecule illuminated by an X-FEL. The research program will bring together physicists, chemists and biologists to develop fundamentally new approaches to probing biological structures and processes.

Professor Nugent completed his PhD in Physics at The Australian National University. His PhD research resulted in the development of a novel imaging method for plasma physicists for which he and his collaborators at the Lawrence Livermore National Laboratory received an *R&D100 Award* (1988) as one of the most significant 100 inventions for that year.

He led the establishment of an internationally recognised cluster of scientific expertise in coherent x-ray science in Melbourne and, for more than 15 years, has maintained active programs at the Lawrence Livermore Laboratories and the Advanced Photon Source in the USA.

Professor Nugent's research has had a significant impact on x-ray and visible optics and developed novel lenses for x-ray astronomy as well as new phase determination techniques. He is co-inventor on 10 patent families in x-ray optics, imaging and phase determination.

Professor Nugent was elected to the Australian Academy of Science in 2000 and has been awarded several prizes, including a second *R&D100 Award* (2002), a *Centenary of Federation Medal* (2003) and the *Victoria Prize* (2004).

This is his second *Federation Fellowship*.

## PROFESSOR MICHAEL PARKER

Project*: Structural neurobiology – developing a new capability in Australia to treat mental illness*

Current institution: St Vincent's Institute of Medical Research

Host institution: St Vincent's Institute of Medical Research

Primary research field: Neurosciences

Professor Michael Parker is an Associate Director of the internationally recognised St Vincent's Institute of Medical Research, where he is Head of the Biota Structural Biology Laboratory. He is a Senior Principal Research Fellow of the National Health and Medical Research Council and a Professorial Fellow at The University of Melbourne.

Professor Parker's research program, which will involve extensive use of the Australian Synchrotron Facility due to open in 2007, will provide the catalyst for establishing a Structural Neurobiology Centre to complement existing excellence in neuroscience research in Australia.

Structural biology tools will be applied to a number of membrane proteins such as chloride channels and G-protein coupled receptors, leading to fundamentally new concepts in signal transduction. These tools for determining the three-dimensional shapes and functions of proteins will be used to gain new knowledge about the molecular basis of various mental illnesses.

The knowledge will then be used to develop, in partnership with the Australian biotechnology industry, new therapeutic drugs to ameliorate or combat mental diseases.

Professor Parker's success in bringing in new technologies such as electrophysiology and cell-free expression to support his interest in determining the three-dimensional structures of key proteins involved in neurobiology, particularly ion channels, has attracted new commercial partnerships with Prana Biotech (amyloid precursor protein) and Nordic Biosciences of Denmark (chloride channels).

Professor Parker completed his PhD in Protein Crystallography at the University of Oxford. After obtaining his PhD, he was appointed staff scientist at the European Molecular Biology Laboratory in Germany (EMBL). While at EMBL, Professor Parker solved the first published 3D atomic structure of a pore-forming protein toxin, which provided a molecular understanding of how water-soluble proteins pass through biological membranes. This, and subsequent work on pore-forming toxins in Australia, has proven to be a seminal contribution to understanding this fundamental biological process.

He has received several awards, including the *Walter Burfitt Prize* (2002) and the *GE Healthcare Bio-Sciences Award* (2004).

PROFESSOR HUGH POSSINGHAM

Project*: Theory for global biodiversity conservation*

Current institution: The University of Queensland

Host institution: The University of Queensland

Primary research field: Environmental sciences

Professor Hugh Possingham is an ARC *Australian Professorial Fellow* and Director of The Ecology Centre at The University of Queensland. In 1995, he was appointed Foundation Chair of Environmental Science at The University of Adelaide. He became joint Professor in The University of Queensland's Departments of Zoology and Entomology and Mathematics in 2000.

Australia's biological diversity underpins much of our economic wealth—the remarkable diversity of coral reefs, for example, fuels a multibillion dollar tourism industry.

Professor Possingham will use decision theory tools to devise efficient solutions for pressing national and global problems. He will create new theory and freely available tools for building systems of marine reserves that allow for catastrophic threats to an environment, such as coral bleaching and hurricanes.

Professor Possingham will take a new approach to solving problems in conservation biology, using global databases and decision theory tools to address the allocation of resources between regions to achieve the maximum benefit to the environment.

A Rhodes Scholar, Professor Possingham completed his PhD in Mathematical Ecology at the University of Oxford. He was elected a Fellow of the Australian Academy of Sciences in 2005 and has received numerous awards, including the *Eureka Prize* (1999), the inaugural *Fenner Medal* (2000) and the *Australian Mathematics Society Medal* (2001).

Professor Possingham has been on the editorial boards of *The American Naturalist* and *Conservation Biology.* He is a serving member on the editorial board of *Ecology Letters*.

He also takes a direct interest in community service, providing advice to the Biological Diversity Advisory Committee and the Ministerial Advisory Committee on Biodiversity Hotspots. He is a member of the Wentworth Group.

DR JAMIE ROSSJOHN

Project*: An investigation into infection, immunity and rational drug design*

Current institution: Monash University

Host institution: Monash University

Primary research field: Biochemistry and cell biology

Dr Jamie Rossjohn is an ARC *Australian Professorial Fellow* and Wellcome Senior Research Fellow in the Department of Biochemistry and Molecular Biology at Monash University, where he leads a team of 22 researchers.

Dr Rossjohn is a leading x-ray crystallographer, having received national awards in the field and presented keynote addresses at Australian Crystallographic and Biophysical Society meetings.

His research activities centre on receptor function and dysfunction, with particular emphasis on structural immunology.

The survival of species reflects a delicate balance between infection and immunity and Dr Rossjohn aims to generate fundamental advances of knowledge in these areas.

He will focus on three broad, yet interrelated, areas of immunity, infection and rational drug design. This cluster is inter-linked to create a holistic and systematic study of host recognition, responses developed by the pathogen, and drug design to modulate and/or counteract these events.

The information gleaned from the research will lead to the rational development of therapeutics, with potential to have an impact on the area of biomedical health globally.

Dr Rossjohn completed his PhD in x-ray crystallography at Bath University. Since then, he has designed, established and now heads the Protein Crystallography Unit in the Department of Biochemistry and Molecular Biology at Monash University. He has also held an NHMRC RD Wright Fellowship at St Vincent's Institute of Medical Research.

He has received several awards, including the *Ramaciotti New Investigator Award* (2001), the Australian Society of Biochemists and Molecular Biologists' *Roche Medal* (2003) and the Science Minister's *Prize for Life Scientist of the Year* (2004).

## DR TONI SHIPPENBERG

Project: *Cellular and neurochemical basis of drug addiction*

Current institution: National Institute on Drug Abuse

Host institution: The University of Sydney

Primary research field: Neurosciences

Dr Toni Shippenberg is Section Chief of the Integrative Neuroscience Section of the National Institute on Drug Abuse (NIDA) and the only scientist from NIDA who has been appointed to the Senior Biomedical Research Service of the US government.

Dr Shippenberg is considered an international leader in addiction research, with outstanding skills in behavioural neuroscience, neurochemistry and cellular neuroscience. At the Max-Planck-Institute for Psychiatry, she took part in establishing one of the first research teams to investigate the biological mechanisms of addiction. Her work has significantly contributed to the acceptance of addiction as a brain disorder.

Addiction to drugs such as heroin, amphetamines, cocaine, nicotine and alcohol is a major global and national problem and the cause of many premature deaths. Drug abuse leads to the long-term disruption of brain functions and causes the loss of control over urges to consume drugs.

Dr Shippenberg will investigate the functional restructuring of brain circuits that occurs during compulsive drug use and leads to hedonic dysregulation. The identification of neuroadaptations occurring in the brain of a drug user will improve the understanding of the neurobiology of the addiction.

Her research will be essential for the development of effective strategies to prevent and treat addictions.

Dr Shippenberg completed her PhD in Pharmacology at the Baylor College of Medicine, USA. She plays an editorial role for several international academic organisations, international journals and the pharmaceutical industry.

Dr Shippenberg has received several prestigious awards for her outstanding research and mentoring achievements, including the National Institutes of Health's *Outstanding Mentor of the Year* (2005).

## ASSOCIATE PROFESSOR DAVID STUDDERT

Project*: Using law to improve population health and the quality of health care services*

Current institution: Harvard University

Host institution: The University of Melbourne

Primary research field: Policy and administration

Professor David Studdert is a Professor and joint Leader in the Harvard School of Public Health's Law and Public Health Program. He is also a barrister and solicitor, admitted to the Supreme Court of Victoria.

Professor Studdert has been instrumental in building and running health law programs at two US institutions. In 1998, he launched a RAND Corporation health law initiative jointly backed by RAND Health and RAND's Institute for Civil Justice.

In 2000, he returned to Harvard following a series of high-profile studies of legal disputes between patients and health insurers and a contract with the State of California to analyse the effectiveness of involuntary treatment laws for the mentally ill.

Professor Studdert will return to Australia to build a world-class research capacity in empirical health law at The University of Melbourne and foster innovative scholarship nationally in this area. He aims to address improvements in health care quality, regulation and population health.

His research program will combine methods from the social and statistical sciences with traditional legal analysis to explore a set of pressing policy issues at the intersection of legal and health systems in Australia. Specifically, he will investigate:

- medical negligence litigation, consumer complaints and the gradual diminution in quality of care that these events may expose
- innovative approaches to compensation and dispute resolution in accident compensation schemes for workplace and automobile injury
- the role and impact of coronial investigations in injury prevention, and
- the clash of law and science in litigation over severe birth injuries.

Professor Studdert completed his PhD in Health Policy at the Harvard School of Public Health. He has acted as a consultant for, and served on advisory committees with, government, the insurance industry and the health care and legal professions.

He has received several prestigious awards, including the *Independent Scientist Award (KO2)* from the National Institutes of Health and the Agency for Healthcare Research and Quality (2000-04) and the *Alice S Hersh New Investigator Award* from AcademyHealth (2004) for young outstanding health services researchers.

PROFESSOR GRAEME TURNER

Project*: Television in the post-broadcast era: The role of old and new media in the formation of national communities*

Current institution: The University of Queensland

Host institution: The University of Queensland

Primary research field: Journalism, communication and media

Professor Graeme Turner is Professor of Cultural Studies and Director of Research in the Faculty of Arts at The University of Queensland. He is Director of the Centre for Critical and Cultural Studies and Convenor of the ARC Cultural Research Network.

Professor Turner is a key figure in the development of cultural and media studies in Australia and has an outstanding international reputation. His work is used in a range of disciplines: cultural and media studies; communications; history; literary studies; and film and television studies.

Professor Turner has pioneered the study of the wider cultural impact on society of media and the economy of media industries that play a major role in trade and cultural exchange. His new research program will examine the role of television, a major source of the world's information and ideas, at a time when the media is underdoing rapid transformation and on-line content and commentary are influencing the cultural views, political attitudes and patterns of consumption of a new generation.

Professor Turner's work will provide an international overview of contemporary media systems in the midst of dramatic change, comparing five countries and one multinational single-language market. The findings can be expected to equip Australia to better understand and manage the complex role of the media in socio-cultural change, inform a fundamental rethinking of the relations between contemporary media, the individual consumer and the nation-state, and provide policy advice of use to government and industry.

Professor Turner completed his PhD in English at the University of East Anglia. In 2005, he was elected President of the Australian Academy of the Humanities.

He has received several awards, including a *Centenary Medal* for services to cultural and media studies and the humanities (2003). Professor Turner has served on the editorial and advisory boards of the following publications:

- *Media International Australia Incorporating Culture and Policy*
- *Australian Literary Studies*
- *Australian Studies in Journalism*
- *Cultural Politics*
- *International Journal of Cultural Studies.*

PROFESSOR PASCAL VAN HENTENRYCK

Project*: Adaptive and integrated resource allocation*

Current institution: Brown University

Host institution: Monash University

Primary research field: Mathematics

Professor Pascal Van Hentenryck is a Professor of Computer Science at Brown University. A world-leading expert in constraint programming, his work has had a significant impact on artificial intelligence, programming languages and operations research.

Before taking up his position at Brown University, Professor Van Hentenryck was the principal designer of the CHIP programming system at the European Computer-Industry Research Centre.

Professor Van Hentenryck envisages the application of new adaptive and integrated optimisation systems in critical areas, such as emergency response systems for hospitals, containment of bushfires and pandemics, and recovery from failure of energy infrastructure. These systems can also be expected to provide improved solutions to existing logistics and manufacturing problems, making industries more effective and reactive.

Professor Van Hentenryck's research program will take a cross-disciplinary approach to integrating existing expertise in constraint and mathematical programming, statistics, machine learning and data mining available in Melbourne.

Professor Van Hentenryck completed his PhD in Computer Science at the University of Namur, Belgium. He has an extensive network of international contacts and has been successful in collaborating with industry partners to design and implement innovative software systems that include novel research ideas and address critical needs.

Professor Van Hentenryck's outstanding contributions to his field of research have been recognised with several prestigious awards, including the *NSF Young Investigator Award* (1993), the *INFORMS Computing Society Award* (2002) and the *IBM Faculty Award* (2004).

Professor Van Hentenryck has served on the editorial and advisory boards of the following publications:

- *Journal of Artificial Intelligence Research*
- *Journal of the Theory and Practice of Logic Programming*
- *Constraints*
- *Journal of Logic Programming*
- *New Generation Programming*
- *Journal of Functional and Logic Programming*.

## PROFESSOR GUIFRE VIDAL

Project*: Quantum information and entanglement: A new framework for science and technology with quantum many-body systems*

Current institution: The University of Queensland

Administering institution: The University of Queensland

Primary research field: Information, computing and communication sciences

Professor Guifre Vidal is a Professor of Quantum Information Science in the School of Physical Sciences at The University of Queensland.

Professor Vidal is one of the world's leading researchers in the areas of quantum information science, quantum many-body systems and computational quantum physics. His theoretical work in these areas is the basis of further international research.

Professor Vidal will develop a theoretical framework and computational tools for the study and engineering of quantum systems. His research will improve the understanding of quantum many-body systems and play a critical role in the development of emergent technologies like nanotechnology and quantum computers.

Professor Vidal's research program will build on the already existing expertise at The University of Queensland in quantum physics and technology and further consolidate Australia's leading position in this area of research.

Professor Vidal completed his PhD in Quantum Information at the University of Barcelona. At 31 years of age, he is an early-career researcher whose work has been published in prestigious international journals and attracted a large number of citations.

Professor Vidal has received the prestigious European Community *Marie Curie Postdoctoral Fellowship* for young researchers (2000-02) and the *Sherman Fairchild Postdoctoral Fellowship* (2003-2005).

## PROFESSOR GORDON WALLACE

Project*: Nanobionics*

Current institution: University of Wollongong

Host institution: University of Wollongong

Primary research field: Biomedical engineering

Professor Gordon Wallace is an ARC *Australian Professorial Fellow* and Director of the Intelligent Polymer Research Institute at the University of Wollongong and Director of the ARC Centre for Nanostructured Electromaterials. He will serve as Research Director for the ARC Centre of Excellence in Electromaterials Science.

Professor Wallace is highly regarded internationally for his research on conducting polymers, polymer composites, carbon nanotubes, electrosyntheses of functional materials and materials characterisation using electrochemical mapping techniques.

Nanobionics is the use of nanotechnlogy to bridge the biology-electronics interface and promises to revolutionise medical science.

A major outcome of Professor Wallace's research is expected to be a dramatically improved quality of life for patients with heart implants, neuromuscular disorders and spinal cord injuries.

He aims to develop novel chitosan-based nanostructured biocomposite electromaterials and to use these materials in wearable structures capable of monitoring and manipulating human movement. The resulting electromaterials will be used as a platform to control adhesion and proliferation of mammalian cells such as muscle, endothelial and nerve cells.

Professor Wallace has supervised more than 50 higher degree students and established diverse domestic and international research networks. He has collaborated with researchers from the University of Pennsylvania, Massey University, CNRS, the University of Texas at Dallas, Trinity College and Dublin City University.

His research group has developed a strong patent portfolio with licences to commercialise to partners in Europe and the USA. Financial support for his research has come from Bluescope Steel, Rio Tinto, Polartechnics, Mitsubishi Rayon, Dionex Corp and three Australian Cooperative Research Centres.

Professor Wallace completed his PhD in Chemistry at Deakin University. He is a Fellow of the Australian Academy of Technological Sciences and Engineering, the Royal Australian Chemical Institute and the Institute of Physics (UK).

Professor Wallace has been awarded ARC Fellowships at the University of Wollongong – a *QE II Fellowship* in 1992, a *Senior Research Fellowship* in 1997 and an *Australian Professorial Fellowship* in 2002.

PROFESSOR ANDREW WHITE

Project*:* Integrated quantum photonics

Current institution: The University of Queensland

Host institution: The University of Queensland

Primary research field: Physical sciences

Professor Andrew White is a Professor of Physics in the School of Physical Sciences at The University of Queensland and Program Manager within the ARC Centre for Quantum Computer Technology.

Professor White has contributed to fundamental and methodological advances in the fields of quantum information sciences and quantum optics.

Australia is a leader in quantum science and technology. From nanotechnology to quantum computers, amazing advances are being made possible as we harness the laws of quantum physics.

Professor White has designed and overseen the construction of the Quantum Technology Laboratory, a facility unique in Australia and one of only a handful world-wide that are custom built for quantum photonics.

Through his research program, Professor White aims to enhance Australia's profile in this discipline by developing a new technology that allows photons to be added together to form powerful quantum machines and, using this, to explore the phenomena that make quantum technology powerful.

Professor White completed his PhD in Physical Sciences at The Australian National University. He has been awarded an *Australian National University Medal* (1998) and *The University of Queensland Foundation Research Excellence Award* (2004*).*

Professor White is a reviewer for leading international journals in the fields of physics and optics, including *Nature, Physical Review Letters* and *Optics Letters.*

For more information, visit www.arc.gov.au.

May 2006