

Summary of Discovery Projects Applications for Funding to Commence in 2006

New South Wales

Macquarie University

DP0665680 Dr M Choat

Approved Project Title **Religious authority and linguistic change in late antique Egypt: non-elite perspectives on the rise of monasticism in contemporary documents**

2006 : \$35,000

2007 : \$35,000

2008 : \$35,000

Primary RFCD 4402 RELIGION AND RELIGIOUS TRADITIONS

Administering Institution Macquarie University

Project Summary

This will enhance Australia's hard-earned profile in the fields which contribute to its approach, promoting internationally the quality of local research. It poses questions which multilingual societies drawn from different migratory strands and strong indigenous traditions must face. Its answers will contribute to the debates Australia continues to have on these issues. It directly contributes to the preservation of the culture of Australia's own Coptic community, facilitating access to its own traditions, and providing a research focus to complement Macquarie's new commitment to the teaching of the Coptic language and history. The resulting monograph will transform international scholarship on a key development of world civilisation.

DP0665723 A/Prof A Cranny-Francis

Approved Project Title **Skin Jobs: Biopolitics, Embodiment and Haptic Technologies**

2006 : \$46,000

2007 : \$23,000

2008 : \$35,000

Primary RFCD 4203 CULTURAL STUDIES

Administering Institution Macquarie University

Project Summary

Haptic technologies use a combination of mechanical pressure and electrical impulses to simulate human touch, and have potential applications in a wide variety of fields including medicine, education, disability services, and entertainment. This project will contribute to the development of this technology, by locating the cultural meanings associated with touch and so enabling applications to be developed for specific audiences and users. The project thereby contributes to the development of smart technologies and, in its combination of resources from science and the arts, promotes a culture of innovation - both of which are essential to Australia's economic future.

DP0663373 Dr NR Daczko; Dr JA Dickinson

Approved Project Title **Spreading ridge sedimentation processes: a novel approach using Macquarie Island as a natural laboratory.**

2006 : \$60,000

2007 : \$70,000

2008 : \$65,000

Primary RFCD 2601 GEOLOGY

Administering Institution Macquarie University

Project Summary

This research will examine the south eastern tectonic plate boundary of Australia, providing analogues for seafloor spreading related crustal processes that relate to present plate boundaries and ancient examples now joined to the Australian continent. The scientific innovation represented by this project will help Australian scientists to better understand an important part of the plate tectonic cycle. This project will be of direct relevance to the Australian minerals exploration industry and will provide better constraints on rift-related metallogenesis.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0663431 A/Prof X Duong

Approved Project Title **A new approach in Harmonic Analysis: Function spaces associated with operators and their applications**

2006 : \$92,000

2007 : \$82,000

2008 : \$84,000

Primary RFCD 2301 MATHEMATICS

Administering Institution Macquarie University

Project Summary

Harmonic analysis is an important part of modern mathematics which has extensive applications in the theory of partial differential equations. The type of mathematics in this project is closely related to theoretical work of applied technology such as signal processing and medical research. Australia is known as a world leader of harmonic analysis and this project ensures that we can keep the leading edge in research in this field.

DP0664714 A/Prof CS Evans; Dr PW Taylor

Approved Project Title **Multi-modal signals: an experimental analysis**

2006 : \$95,000

2007 : \$72,000

2008 : \$72,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution Macquarie University

Project Summary

This project is built upon innovations that permit the first exploration of an important, but previously-inaccessible, problem. We will continue to develop techniques with wide applicability for the analysis of movement, and will make them available to other research groups. The proposed work addresses a hot topic that is generating international attention; it will hence make a distinctive Australian contribution to a rapidly expanding research area. Results will be communicated through the WWW and science documentaries. Animal Behaviour is of great interest to the general public. This can be engaged to attract more young people to careers in science. We will continue to train postgraduates in a well-resourced and stimulating environment.

DP0666232 Prof PR Hayward; Mr DC Crowdy

Approved Project Title **Melanesian Popular Music, Local Recording Industries and Copyright**

2006 : \$80,000

2007 : \$97,000

2008 : \$26,000

2009 : \$24,000

Primary RFCD 4101 PERFORMING ARTS

Administering Institution Macquarie University

Project Summary

Australia has recently begun to express heightened concern for the social and economic sustainability of its Melanesian regional neighbours. Along with providing aid and peace-keeping forces, we are now exploring the distinctive forms of local socio-economic practices. These practices resist easy incorporation into Australian or broader Western norms. The project aims for informed dialogue and debate to better understand local cultural and industrial practices. It will be of significant benefit to Australia in its engagement with the cultures of Papua New Guinea, the Solomon Islands, Vanuatu and Fiji.

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DP0662884 Dr A Henderson-Sellers

Approved Project Title **Stable water isotopic simulation and analysis to improve Earth System models and deliver better predictions of Australian water resource vulnerability**

2006 : \$210,000
2007 : \$165,000
2008 : \$170,000
2009 : \$180,000
2010 : \$180,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES
APF Dr A Henderson-Sellers

Administering Institution Macquarie University

Project Summary

As Australia's challenges in environmental sustainability rival those anywhere on Earth, we must be clever in our diagnosis of susceptibility and insightful in proposed remedies. Climate change and variability have impacts on people and society that must be managed effectively whatever their causes. Of importance to Australia is the availability of water for drinking and agriculture. The new, interdisciplinary ARC network for Earth System Science provides models for novel and synergistic research such as naturally occurring water isotopes as a tool for improving predictive skill and confidence. We exploit these and leverage international programs to improve regional hydro-climate and water resource understanding in Australia.

DP0662873 Dr ME Herberstein; Dr T Tregenza

Approved Project Title **The evolution of insect genitalia: phallic reversal in Australian praying mantids**

2006 : \$90,000
2007 : \$75,000
2008 : \$75,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution Macquarie University

Project Summary

This project will enhance our knowledge of the evolutionary processes that drive biodiversity within species and speciation itself. These issues are fundamental to evolutionary biology, and are of great interest for the general public. We have been extraordinarily successful in communicating our research to the public via natural history articles and films. We will continue to generate high impact publications from this research that will increase the international research profile of Australia in the scientific community. This project will establish international collaborations between Australia and the University of Exeter in Cornwall (UK) and provide employment and high quality training to a research associate and a research assistant.

DP0665761 Dr LA Hughes; Prof AJ Beattie; Dr DP Faith; Prof RL Kitching

Approved Project Title **A new phylogenetic framework for estimating local, regional, and global biodiversity**

2006 : \$150,000
2007 : \$127,000
2008 : \$127,000

Primary RFCD 2707 ECOLOGY AND EVOLUTION

Administering Institution Macquarie University

Project Summary

Australia is one of the 12 megadiverse countries that together account for 75% of global biodiversity. Invertebrates comprise the single largest component of biodiversity. The Australian invertebrate fauna is poorly known and therefore most conservation planning takes place in the absence of knowledge about the group that contributes most to biodiversity. This project will provide novel methods for estimating invertebrate species richness for conservation planning as well as contributing to the important debate about the magnitude and distribution of global biodiversity.

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DP0663874 Prof JM Joss; Ms ZM Johanson; Dr PE Ahlberg; Dr P Sordino; Prof GP Wagner

Approved Project Title Lungfish Paired Fins and the Origin of Limbs as an Evolutionary Novelty.

2006 : \$110,000

2007 : \$80,000

2008 : \$80,000

Primary RFCD 2702 GENETICS

Administering Institution Macquarie University

Project Summary

This project will utilise a uniquely Australian animal, the lungfish, to address a hitherto unresolved problem of considerable scientific significance - how a fish fin evolved into a tetrapod (four-legged animal) limb. The Australian lungfish is the most primitive of the four surviving genera of lobe-finned fish and is recognised as the closest living ancestor to the tetrapods. It is listed as 'vulnerable' in its native habitat. Macquarie University, however, has the only captive breeding population of lungfish in the world. We are thus uniquely placed to address critically important questions concerning the evolution of fish into tetrapods.

DP0664551 Dr M Kangas

Approved Project Title Expressive Writing: An Investigation of How Writing About Stressful Experiences Can Be Used to Enhance Psychological and Physical Health Benefits

2006 : \$80,000

2007 : \$65,000

2008 : \$68,000

Primary RFCD 3212 PUBLIC HEALTH AND HEALTH SERVICES

Administering Institution Macquarie University

Project Summary

An experimental writing technique that involves writing about one's personal stressful experiences by using emotive descriptive words has been found to be helpful in improving mental health and physical functioning in various populations. This study will test how this expressive writing task leads to health benefits in two distinct samples; cancer survivors and healthy individuals. By identifying the methods by which this writing task can improve health functioning, this project will assist in adapting this task for use as a therapeutic technique in clinical settings to enhance the well-being of Australians. This will place less demands on health services, reduce absenteeism, and improve productivity.

DP0665068 Dr F Liu; Dr MP Molloy

Approved Project Title Natural Product-derived Proteomics Probes for Specific Detection of Protein Kinase C Activities

2006 : \$130,000

2007 : \$90,000

2008 : \$90,000

Primary RFCD 2503 ORGANIC CHEMISTRY

Administering Institution Macquarie University

Project Summary

Better health care depends on how well diseases are understood and how accurately disease analysis and diagnosis can be carried out. This is not only important to disease treatment but also prevention. This project will first generate new compounds that could have improved therapeutic value in cancer treatment. In addition, these compounds will be further engineered to provide a new technology of tracing the molecular signature of diseases such as cancer for early detection and better preventative care and treatment. This will create new economic advantage and contributes to the transformation of Australian health care industry.

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DP0665969 A/Prof CA Mackenzie

Approved Project Title **Autonomy and Identity: A Relational Theory**

2006 : \$40,000

2007 : \$20,000

Primary RFCD 4401 PHILOSOPHY

Administering Institution Macquarie University

Project Summary

Autonomy is widely regarded as an important value in liberal democratic societies and underpins many of the basic rights and legal protections enjoyed by citizens. The principle of respect for autonomy is a guiding ethical principle in a range of areas, including in medical and legal contexts, for example in requirements regarding informed consent, and in ethical guidelines governing protocols for research involving human subjects. A better understanding of autonomy and its relationship to the social context has the potential to produce indirect socio-economic benefits by informing theory and practice in these and other areas.

DP0663974 A/Prof BP Mans; Dr P Jacquet

Approved Project Title **Algorithmics for Extremely Mobile Wireless Networks**

2006 : \$108,000

2007 : \$86,000

2008 : \$88,000

Primary RFCD 2917 COMMUNICATIONS TECHNOLOGIES

Administering Institution Macquarie University

Project Summary

Existing wireless network protocols need stringent conditions to be effective. These conditions are rarely met for concrete applications such as Defence, Disaster-Relief, Search-and-Rescue. All these cannot rely on existing infrastructure, and often require high mobility. This is crucial in the case of Australia which cannot rely on complete network coverage of its lands and seas. This project will develop new wireless protocols for applications requiring extreme mobility. It will increase Australia's control of this, now ubiquitous, technology thus rendering Australia a key player in this field.

DP0665528 Dr JA Mathews

Approved Project Title **Cyclical industrial dynamics in high-technology industry: The case of Flat Panel Displays**

2006 : \$90,000

2007 : \$70,000

2008 : \$90,000

Primary RFCD 3502 BUSINESS AND MANAGEMENT

Administering Institution Macquarie University

Project Summary

Australian high-technology industry policy is strongly focused on securing entry by Australian firms into such industries as semiconductors and flat panel displays (which utilize ICT and photonics technologies). Success to date has been modest. One of the prime barriers to entry is the cyclical character of the industries - in the sense that firms in East Asia appear to have secured entry only during downturns. A deeper understanding of the cyclical industrial dynamics of such industries promises to enhance the prospects for successful entry by Australian firms, and thereby contribute to fulfilling the goals of public policy in this area.

Summary of Discovery Projects Applications for Funding to Commence in 2006

DP0664108 A/Prof PC Menzies

Approved Project Title **Mental Causation in a Physical World**

2006 : \$35,000

2007 : \$20,000

2008 : \$25,000

Primary RFCD 4401 PHILOSOPHY

Administering Institution Macquarie University

Project Summary

The issues concerning mental causation are not just philosophical issues. They are discussed in the fields of psychology, cognitive science, and psychiatry as questions about whether mental phenomena, eg mental illnesses, are best understood at the cognitive level or the neurophysiological level of causation. The project will result in a research monograph aimed at practitioners from these fields among others. By introducing these practitioners to recent philosophical thinking about causation and reduction, the present project may lead to more subtle ways of conceptualising and treating mental illnesses, and so contribute indirectly to the socio-economic benefits accruing from more reflective psychological and psychiatric practice.

DP0663629 Dr MP Molloy

Approved Project Title **Differential Isotope Proteome Mapping of Transforming Growth Factor Beta Cell Signalling**

2006 : \$60,000

2007 : \$30,000

2008 : \$45,000

Primary RFCD 2504 ANALYTICAL CHEMISTRY

Administering Institution Macquarie University

Project Summary

Our research will capitalise on Australia's expertise and prior infrastructure investments in frontier, proteomic technologies to elucidate novel intracellular signalling pathways that contribute to the development of cancer. New approaches will be developed using isotopes to provide sensitive and accurate measurements of changes in protein expression levels. This technology will allow us to define complex intracellular signalling networks. This is an important step towards identifying new drug targets that are responsible for tumour growth. Australian science will benefit from the training of new scientists in modern, post-genome technologies where there is currently a world shortage of experienced personnel.

DP0663054 A/Prof MH Morley; Mr CJ McGillion

Approved Project Title **Brokering Democracy: United States Policy toward Chile from Nixon to Bush Sr. (September 1973-December 1989)**

2006 : \$40,000

2007 : \$20,000

Primary RFCD 3601 POLITICAL SCIENCE

Administering Institution Macquarie University

Project Summary

Australia's capacity to interpret and engage its regional and global environment is more dependent on thorough analysis of American foreign policy than ever before. Distinguishing between US and Australian national interests is vital to avoid making commitments that prove harmful to Australia's best interests and its international standing. The way in which the US resolved the tensions between national interest and democracy promotion in Chile provides a key reference point for subsequent US interventions in the Third World up to the present. Public discussion about contemporary US foreign policy will be encouraged via newspaper articles, media interviews, and a companion website to the monograph

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DP0665038 Mr SG Nielsen

Approved Project Title **Thallium isotopes: a novel geochemical tracer to map recycling in Earth's mantle**

2006 : \$105,000

2007 : \$80,000

2008 : \$85,000

Primary RFCD 2601 GEOLOGY

APD Mr SG Nielsen

Administering Institution Macquarie University

Project Summary

This project will transfer to Australia an advanced new methodology: the characterisation of thallium isotopic signatures in the mantle system introduced during recycling of crustal material. This will allow the tracking of fluid processes in the mantle system in a completely new way and will provide significant new information about the fluids that can percolate up from subduction zones. The source of most economically interesting elements in the crust is from mantle-derived fluids, so their characterisation is critical to an understanding of the whole ore-forming process. Hence, this study will provide unique new information to apply to this important large-scale Earth problem.

DP0663452 Prof JP Pieprzyk; Dr C Charnes; Dr S McCallum

Approved Project Title **Algebraic Properties of Cryptographic Components and their Cryptanalysis**

2006 : \$123,000

2007 : \$113,000

2008 : \$115,000

Primary RFCD 2805 DATA FORMAT

Administering Institution Macquarie University

Project Summary

The outcomes will enhance information and communication security, which is absolutely crucial for the rapidly growing e-commerce and e-government services in Australia. International collaboration will be strengthened by reciprocal exchange of researchers and postgraduate students leading to more attractive and productive research environment. Our project will help to maintain a high profile of Australian researchers, to increase the capacity for consultancy and contract work, and provide a cutting-edge information technology for the Australian telecommunications industry, business and government.

DP0662887 Prof AJ Pitman; Dr Y Wang; Dr JL McGregor

Approved Project Title **Do terrestrial processes intensify Australian droughts ?**

2006 : \$90,000

2007 : \$75,000

2008 : \$75,000

Primary RFCD 2606 ATMOSPHERIC SCIENCES

Administering Institution Macquarie University

Project Summary

Australia's agricultural productivity is strongly affected by climate, climate variability and climate change. Recent climate changes in Western Australia forced adaptation strategies costing \$500 million while the anomalously intense 2002 Murray-Darling Basin drought significantly affected agriculture. Any further intensification of droughts would affect Australia's rural economy. This proposal will assess the role of terrestrial processes, linked to increasing CO₂, in causing the drought intensification and declines in rainfall. This will provide knowledge that will guide the development of future environmental management strategies.

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DP0665817 Dr SR Scalmer

Approved Project Title **The Circulation of Nonviolence: Gandhi and the History of Global Politics**

2006 : \$45,000

2007 : \$20,000

2008 : \$20,000

Primary RFCD 3701 SOCIOLOGY

Administering Institution Macquarie University

Project Summary

Global protest movements have become a feature of recent campaigns against war and corporate power. The diffusion of protest across national boundaries disrupts official routine, threatens state power, and raises new questions about global citizenship. However, the history, dynamics and novelty of transnational diffusion is still only dimly understood. This project will address such absences. It focuses on the circulation of Gandhian nonviolence, and it offers the first comparative, long-term study of the diffusion of collective action. This will greatly enhance our understanding of the processes currently reshaping politics and society and should enrich the practice of contemporary democratic participation.

DP0665009 Dr NH Smith; Dr J Deranty

Approved Project Title **Applying the Ethics of Recognition: Work and the Social Bond**

2006 : \$80,000

2007 : \$83,000

2008 : \$50,000

Primary RFCD 4401 PHILOSOPHY

Administering Institution Macquarie University

Project Summary

Work matters to most Australians. It is not just of instrumental value, worth it just for the money: a good, fulfilling job is integral to a fulfilled life. Our sense of well-being is inseparably bound up with how things are going at work. But how is this well-being sustained? What moral expectations do we bring to work and what happens when they are not met? This project will develop new answers to these questions by focusing on claims for recognition arising out of work. Experiences of misrecognition at work, we propose, seriously damage one's capacity to lead a fulfilling life. By identifying ways in which recognition can be given or denied at work, the project will be of great community benefit.

DP0665301 Dr DJ Spence

Approved Project Title **Direct deep-ultraviolet tunable laser sources generating continuous and ultra-short-pulse radiation for photonics applications.**

2006 : \$165,000

2007 : \$85,000

2008 : \$85,000

Primary RFCD 2404 OPTICAL PHYSICS

APD Dr DJ Spence

Administering Institution Macquarie University

Project Summary

This project will develop two versatile and efficient sources of tunable deep-ultraviolet laser radiation. These sources are an enabling photonics technology that will have impact in the applied fields of precision spectroscopy and flow cytometry for detection of biological agents. The proposed ultrafast laser source will enable new fundamental research probing high-energy processes, such as ultrafast chemical reactions, on the femtosecond timescale.

Training through an APD fellowship in the national priority area of Frontier technologies: photonics will enhance Australia's expertise in this important area.

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DP0663154 Dr RJ Stevenson; Dr TI Case

Approved Project Title **Testing a disease avoidance account of disgust**

2006 : \$43,206

2007 : \$70,000

2008 : \$75,000

2009 : \$60,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution Macquarie University

Project Summary

Inadequate hand-washing is responsible for some of the yearly 2 million deaths from diarrhoea (WHO), for an estimated 40% of the 80 million cases of foodborne illness in the US (CDC) and for approximately 20% of the 20,000 US deaths from hospital acquired infections (CDC). Although the value of hand-washing as a disease avoidance strategy is well understood by many, even healthcare professionals do not follow hand-washing guidelines. This project examines why the emotion of disgust engenders such potent avoidance of certain disease vectors (e.g. faeces). The project should lead to an understanding of how we can get inadequate hand-washing to also evoke disgust and thus to new and powerful strategies to improve hand-washing compliance.

DP0663514 Prof RH Street

Approved Project Title **Categorical structures in string theory**

2006 : \$95,000

2007 : \$82,000

2008 : \$84,000

Primary RFCD 2301 MATHEMATICS

Administering Institution Macquarie University

Project Summary

The proposal is a contribution to the mathematics of fundamental laws of nature. Developments in string theory are unfolding internationally from top physicists and mathematicians. Basic research by our expert group of category theorists will reach out into the Australian community to varying degrees through our own teaching, vacation scholars, media interviews, and links with our academic colleagues in other disciplines. Such basic research underpins the capacity of the private sector by providing skilled graduates and enhancing the capabilities of the economy. Australia must maintain expertise in basic science and technology to be ready for uncertain future demands.

DP0663691 Dr PW Taylor; Prof R Jackson

Approved Project Title **How Stenolemus Assassin Bugs Crack Spider Codes**

2006 : \$80,000

2007 : \$65,000

2008 : \$70,000

Primary RFCD 3801 PSYCHOLOGY

Administering Institution Macquarie University

Project Summary

This unique study of sophisticated behavioural flexibility and dynamic sensory exploitation in an insect will provide novel insights into how simple cognitive architecture can be used to solve complex problems. These insights are important for the development of artificial intelligence systems. This will be the first study of flexible aggressive mimicry in an insect and will attract considerable international attention, raise the profile of Australian science and support numerous students. We will make the first use in Australia of state-of-the-art vibration recording and interactive playback techniques. Making these powerful experimental tools available in Australia will enable other many additional innovative lines of research.

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DP0662967 Dr S Velayutham; Dr AY Wise

Approved Project Title **Transnational Affect and the Moral Economies of Temporary Skilled Migration of South Indians to Australia**

2006 : \$80,000

2007 : \$90,000

2008 : \$95,000

Primary RFCD 4203 CULTURAL STUDIES

APD Dr S Velayutham

Administering Institution Macquarie University

Project Summary

India is expected to surpass China soon as Australia's third largest migration source after New Zealand and the United Kingdom. A majority of Indian migrants to Australia work in highly skilled occupations, a large proportion of whom arrive on a temporary skilled migration visa (457). There is intense international competition for these highly educated and skilled migrant workers and this migration category represents a major new direction in Australia's migration policy. The proposed study will provide significant insights for policy makers into the impacts of the new temporary skilled migration scheme on both the temporary migrants and the wider Australian community.

DP0663847 Prof MR Walter; Prof AH Knoll

Approved Project Title **A revolution in Earth History: Life and Environment in the Neoproterozoic (2.5-2.8 Ga)**

2006 : \$50,000

2007 : \$45,000

2008 : \$40,000

Primary RFCD 2601 GEOLOGY

Administering Institution Macquarie University

Project Summary

This research will keep Australian scientists in the forefront of studies of early life on Earth. At a time when there is a great deal of interest in this topic because of the search for similar life elsewhere in the Solar System, this work will take a prominent place in international research. It will attract leading researchers from elsewhere, with consequent intellectual benefits, and will inspire students to careers in science.

DP0665035 Dr H Wang; Prof JR Seberry; A/Prof C Xing; Prof Y Desmedt

Approved Project Title **Secure Multi-Party Computation**

2006 : \$165,000

2007 : \$114,000

2008 : \$111,000

Primary RFCD 2805 DATA FORMAT

Administering Institution Macquarie University

Project Summary

The outcomes of this project will enhance information protection which is crucial for rapidly growing e-commerce service and strengthen national safeguard capability of our digital systems and infrastructure. It will contribute to maintain Australia's leading position in the telecommunication and information industries. It will contribute to the quality of our culture by protecting individual's privacy and providing security for sensitive data.

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DP0664537 Prof B Wood; Prof D Rubie; Dr SP Kelley; Prof R Hervig

Approved Project Title **The behaviour of geochemical tracers during differentiation of the Earth**

2006 : \$150,000

2007 : \$100,000

2008 : \$100,000

Primary RFCD 2601 GEOLOGY

Administering Institution Macquarie University

Project Summary

This project is aimed at providing fundamental data which Earth Scientists will use to understand the processes by which the Earth separated into its chemically-distinct layers (core, mantle, crust, atmosphere, oceans) and to determine the nature of the continuing interactions between the surface environment in which we live and the deep interior. It will provide training in modern high temperature-high pressure materials-science techniques for Ph.D. students and postdoctoral researchers. This will provide Australia with Earth Scientists who have both traditional skills and the ability to work with Materials Scientists on the synthesis of novel materials under extreme conditions.