Minister's Approval for ARC Future Fellowships for Funding Commencing in 2020 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
Australian Capital Territory						
The Australian National University						
FT200100135 Williams, Dr Simon J	This project aims to utilise structural biology, biochemistry and molecular biology approaches to substantially deepen our understanding of rust fungi-plant interactions. Fungal rust pathogens cause disease and significant yield losses in our most important food crops. During colonisation, rust fungi utilise secreted effector proteins to cause plant disease. Effectors can also be recognised by plant immunity receptors, leading to resistance. The intended outcome of this work is to generate knowledge that can be used for the development of disease management and engineering strategies to protect plants from rust fungi. This should provide significant benefits to agricultural productivity and global food security. **National Interest Test Statement** Rust fungi cause significant diseases and devastating crop and yield losses in a large variety of plants, including the cereal crops Australia relies upon for nourishment and economic prosperity. For example, it is estimated that if an incursion of the wheat stem-rust pathotype Ug99 were to occur in Australia it would cost the cereal industry between $1.8-2.7 billion. This project aims to understand how rust pathogens, including wheat stem-rust, cause disease, and how plants recognise and resist infection. The potential outcomes of this fellowship include the development of more advanced technologies for the protection of Australian crops from rust diseases. This work may open the door for the development of tools, such as targeted fungicides directed to fungal pathogens, with the potential to improve our nation's food security and generate enormous economic and environmental benefits for Australia.	197,000.00	194,000.00	188,000.00	189,000.00	768,000.00
FT200100242 Thompson, Dr Barry J	This project aims to understand how the animal body grows. This project expects to generate new knowledge and understanding of the genetic programs that govern the size and shape of animal tissues, through use of cutting-edge genome editing approaches in laboratory animals. Expected outcomes of this project include the production of genetically engineered animals with altered tissue growth, development of new theories for how tissue growth is normally controlled and how it can be manipulated industrially. This should provide significant benefits, impacting stem cell biology (improving stem cell production), tissue engineering (improving growth of artificial tissues), veterinary science and agriculture (improving productivity). **National Interest Test Statement** This project aims to benefit Australia's biotechnology sector by producing transformative new knowledge that will open opportunities for new technological development. Discovery of the key genes that control how animals grow and develop is crucial to enable the development of innovative technologies to grow stem cells, build artificial tissues, and enhance the productivity of livestock. Fundamental discovery of these genes requires cutting edge genetic approaches, high-tech molecular analysis, and high resolution imaging of cells and molecules. Together these approaches will yield a comprehensive understanding of how animal body size and shape are encoded in the genome. This new understanding will allow development of innovative industrial interventions, including new small molecule compounds, with widespread utility in stem cell biotechnology, tissue engineering, veterinary science, and agriculture.	254,332.00	254,332.00	254,332.00	254,332.00	1,017,328.00
FT200100381 Lade, Dr Steven J	Water resources in Australia and worldwide are under severe stress, for example from drought and water demand. This project aims to investigate how water and other natural resources can be managed to build resilience to such stresses. The project expects to develop advances in resilience theory that generate new model-based tools for resilient decision-making. These advances will be tested in a model of water resource management in north-central Victoria. Expected outcomes of the project include increased decision-maker capability to respond to threats to water and other natural resources. Such outcomes will help ensure the sustainability of increasingly highly stressed natural resources in Australia and worldwide.	185,472.00	210,712.00	203,982.00	203,982.00	804,148.00

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	National Interest Test Statement Many parts of Australia are currently experiencing severe drought. Many of Australia's other natural resources are also severely stressed. Building resilience in water and other natural resources is therefore of tremendous national interest for Australia. The tools developed by this project will be capable of generating specific policy pathways for building resilience as well as illuminating potential trade-offs between resilience and short-term economic optimisation. The project will specifically study the Campaspe River catchment in Victoria but it is expected that the results and tools developed will be applicable to other natural resources nationwide. Building resilience of water and other natural resources will lead to improved long-term economic outcomes for the industries and communities associated with those natural resources, as well as improved environmental outcomes for the resources themselves.					
FT200100399 Yung, Dr Po-Lam	This project in mathematics aims to study two recent, promising developments in harmonic analysis, namely Fourier decoupling and Bourgain-Brezis inequalities. The former captures how waves interfere upon superposition; the latter arose initially in the study of the Ginzburg-Landau theory of superconductors. This exciting project seeks to deliver deep insights into how different frequencies interact, and aims to develop powerful new tools to advance the study of partial differential equations and analytic number theory. This Future Fellowship should benefit Australia by improving our scientific capability. It will bring world-class researchers to Australia for collaboration, and put Australia at the forefront of first rate research.	206,000.00	228,101.00	224,101.00	229,000.00	887,202.00
	National Interest Test Statement This Future Fellowship project seeks to create new knowledge in a rapidly growing field of mathematics called harmonic analysis. Harmonic analysis is an essential technology in many parts of a modern economy, including signal processing (used in mobile phone communication), data compression (vital for efficient transmission of information on the internet), and medical imaging, as well as scientific fields such as earthquake modelling and tsunami detection. This project will lead to a better understanding of how a very large number of waves, of many different frequencies and directions, interact. This will pave the way for more sophisticated and efficient algorithms in data compression, medical imaging and cryptography. It will also ensure that Australia has cutting edge expertise in a part of mathematics crucial for our future economic prosperity, national security and healthcare improvement.					
FT200100421 Gould, A/Prof Stephen	The aim of this project is to develop declarative machine learning techniques that exploit inherent structure and models of the world. Deep learning has become the dominant approach for machine learning with many products and promises built on this technology. But deep learning is expensive, opaque, brittle and relies solely on human labelled data. This project intends to make deep learning more reliable by establishing theory and algorithms that allow physical and mathematical models to be embedded within a deep learning framework, providing performance guarantees and interpretability. This would likely benefit machine learning based products that can understand the world and interact with humans naturally through vision and language.	265,001.00	260,991.00	259,095.00	263,625.00	1,048,712.00
	National Interest Test Statement Artificial intelligence (AI), in particular deep learning, is revolutionising business and society. It is forecast to add trillions of dollars to the global economy in the coming decades. Investment in building AI capabilities is in Australia's national interest to ensure competitiveness in this market. This project establishes the fundamental underlying science on which future AI-enabled technology will be built. The project focuses on visual and language perception: giving machines the ability to understand what they see and hear. This will result in trustworthy AI software components and algorithms that can be used in real-world applications. Examples of this include scanning for biosecurity threats at ports of entry, monitoring for environmental hazards including tracking bushfires, safe human-robot interaction, industrial automation, smarter homes and workplaces, and assistance tools for the elderly and visually impaired. This project is at the cutting edge of AI research, it is critical for developing the science which will translate AI technology into vital government and commercial applications.					
FT200100939 Tricoli, Prof Antonio	This project aims to develop nanocomposite electrodes and membranes for efficient production of renewable hydrogen and the next generation of high-energy-density battery technologies. This will be accomplished by the engineering of multi-scale porous materials with tuneable electrical, chemical and morphological properties using earth abundant elements. The intended outcome is the establishment of a scalable methodology for the structuring and effective integration of microporous materials in highly conductive scaffolds, achieving superior charge and molecular transport, as well as high surface activity. Broad social and economic benefits are anticipated providing new technological solutions for renewable energy storage and fuel production.	264,332.00	264,332.00	264,332.00	264,332.00	1,057,328.00

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	National Interest Test Statement					
	This project will tackle two key technological issues required to transition to a renewable energy economy, namely, the design of electrochemical components for the efficient carbon-free production of hydrogen and for the next generation of high-energy-density batteries. This will support the development of technologies for the storage of renewable energy, and the use of renewable energy in transportation and for export, contributing to the Australian export sector and to the reduction of CO2 emissions as per Australia 2030's climate change target. More broadly, the knowledge developed through this project will impact many related technologies and scientific disciplines including filtration, biosensors, and electrocatalysis, offering downstream benefits to society, the economy and the environment.					
	The Australian National University	1,372,137.00	1,412,468.00	1,393,842.00	1,404,271.00	5,582,718.00
	Australian Capital Territory	1,372,137.00	1,412,468.00	1,393,842.00	1,404,271.00	5,582,718.00

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New South Wales						
Macquarie University						
FT200100148 Trueck, Prof Stefan	This project aims to investigate financial innovation for electricity markets that are transforming from fossil-fuel fired power generation to a higher share of renewable energy. The project will create new knowledge on impacts of the decarbonisation of power markets, utilising cutting-edge econometric models, innovative financial products and new measures for market performance and financial risk. Expected outcomes of the project include recommendations for facilitating investment into renewable energy, pricing intermittent generation, guidelines for stress tests and sustainable energy policy. This will help regulators and market participants to better ensure the long-term economic sustainability and financial resilience of the sector. **National Interest Test Statement** The current transition of electricity markets from predominantly fossil-fuel fired power generation to a higher share of renewable energy poses significant challenges for participants and regulators of these markets. Australian wholesale electricity prices are among the highest in the developed world and extremely volatile. This project will deliver new techniques and research infrastructure for the analysis of electricity markets. It will develop a framework that allows for evaluating market performance, financial risks, and the pricing of new financial products related to intermittent energy generation. The project will help to facilitate optimal investments into renewable generation, enhancing clean energy, lower emissions, and the transformation of the electricity sector. The outcomes will contribute to the resilience of electricity markets by reducing the risks faced by participants. By proposing strategies on how to guarantee the economic sustainability of the sector and decreasing the associated cost flow-on to electricity end-users, it will enhance the long-term viability of Australia's industries.	227,127.00	224,332.00	233,692.00	229,352.00	914,503.00
FT200100590 Gross, Dr Simon	In 2016, the United Nations declared access to the Internet as basic human right. Our communication networks are facing a capacity crunch, which will transform a basic human right for everyone into a privilege for a few. This project aims to avoid a capacity crunch by creating innovative solutions for the next generation of optical fibre communication networks. This project stands to generate new knowledge in photonics, optical communication and advanced manufacturing. The expected benefits are new academic collaborations, enhancing Australia's international standing and economic benefit through commercialisation and training of students for the growing photonics industry in Australia. **National Interest Test Statement** The Internet has undoubtedly transformed both our economy and society. While optical fibres are the backbone of the Internet, the currently deployment optical fibres suffer from a fundamental capacity limit. To avoid a capacity crunch, that would bear unimaginable consequences, new technologies are required that can keep up with the ever-growing demand for data. This project aims to develop innovative solutions to make future ultrahigh bandwidth communication networks a reality to avoid such a crunch. Through commercialisation, this project will have a direct economic impact. New collaborations with leading research institutions will strengthen Australia's reputation in the field. Moreover, the training of students in cutting edge technology will contribute to a skilled workforce for Australia's growing photonics industry.	197,798.00	197,533.00	197,794.00	196,417.00	789,542.00
	Macquarie University	424,925.00	421,865.00	431,486.00	425,769.00	1,704,045.00
Southern Cross University						
FT200100449 Burton, Prof Edward D	This project aims to advance our fundamental understanding on the geochemistry of antimony – a critical mineral resource and environmental pollutant of growing concern. This will be achieved by pioneering an innovative combination of advanced synchrotron-based tools and sophisticated isotopic approaches to unravel important interactions between antimony geochemistry and the iron cycle in soils, sediments and aquatic systems. The expected outcomes will provide novel insights into refined strategies to manipulate coupling between antimony mobility and iron cycling for improved rehabilitation of degraded landscapes, safe disposal of hazardous wastes and sustainable exploitation of Australia's valuable antimony reserves.	256,332.00	261,332.00	260,332.00	270,332.00	1,048,328.00

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	National Interest Test Statement Antimony plays a critically important and rapidly growing role in our daily lives, yet it is also an environmental pollutant of increasing global concern. This project will undertake an innovative research program that will benefit the nation by providing significant new insights into the poorly-understood environmental geochemistry of antimony. These insights will contribute to improved assessment and remediation of antimony-contaminated soil and water, and will facilitate better management of hazardous antimony-bearing waste. The outcomes will be of particular benefit to the resource sector by providing fundamental knowledge on antimony geochemistry that will help to facilitate the sustainable future exploitation of Australia's rich endowment of antimony reserves. The project will also create a legacy of benefit by building national and international collaboration, growing research capacity and training the next generation of scientists in research priority areas that are crucial for Australia's future prosperity.					
	Southern Cross University	256,332.00	261,332.00	260,332.00	270,332.00	1,048,328.00
The University of New England						
FT200100372 Moore, A/Prof Mark W	Humans accumulate knowledge and use cumulative culture to transfer it across generations, and identifying the origin of this unique ability is a significant research priority for the study of archaeology and human evolution. This project aims to discover the emergence of cumulative culture by using experiments to evaluate stone tool-making, a technology passed between humans for 3.3 million years. Expected outcomes include international collaborations that improve our evolutionary understanding of teaching and learning, and produce new data on early stone artefacts in Indonesia and Australia. This should provide significant benefits for collaborative research and scholarly insight into human evolution and Indigenous knowledge in our region.	248,609.00	254,986.00	261,918.00	232,882.00	998,395.00
	National Interest Test Statement This project applies an innovative cross-disciplinary re-evaluation of stone tools to identify when culture emerged in human evolution. The project contributes to Australia's national interest by deepening our cultural understanding of our shared past. For all Australians, the project aims to provide significant social benefits by fostering knowledge of culture's role in the evolution of our species, and expanding society's perspectives on the origins of our technology-saturated lives and the modern challenges we face. The project will advance our international research reputation and training capacity by analysing exceptionally old stone tools with colleagues in Indonesia, and more recent stone tools with Aboriginal colleagues in NSW and QLD. The collaboration with Indonesian scientists will enhance research ties with one of our most important economic partners. The collaboration with Indigenous Australians will increase their capacity to look after cultural heritage, leading to enhanced community wellbeing.					
	The University of New England	248,609.00	254,986.00	261,918.00	232,882.00	998,395.00
The University of New South Wales						
FT200100353 White, Dr David	Accurate face recognition is critical to normal social functioning of individuals and identity management processes that underpin a secure and fair Australia. Current understanding is based on tests that do not capture the rich context surrounding person identification in daily life. This project aims to introduce new methods for observing person identification in daily life and real-world tasks that are critical to border security, criminal investigations and the justice system. Expected outcomes include an integrated framework for person identification describing the cognitive mechanisms that link faces to surrounding visual context and the viewer's background knowledge. Benefits in forensic, security and legal settings are expected.	248,593.00	209,032.00	207,775.00	207,775.00	873,175.00
	National Interest Test Statement Governments, police and courts must accurately identify people to ensure fairness of legal processes, the safety of their citizens and to enable secure and efficient access to services. Errors in these tasks can therefore have profound repercussions for society, leading to identity fraud, serious organised crime and wrongful convictions. This project aims to develop a framework for understanding how diverse sources of information interact with face perception to determine the accuracy of person identification decisions. Through international collaboration and linkages with industry, it is hoped that project activities will further Australia's global leadership in this interdisciplinary field, and help to train the next generation of researchers. Knowledge outcomes can be translated directly to: (i) improve the interpretation of eyewitness and CCTV evidence in court; (ii) develop effective recruitment and training tools for specialist person identification roles; and (iii) inform the design of more secure and efficient digital identity management systems.					

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FT200100369 Meng, Dr Ke	This project aims to identify important conceptual gap in the understanding of inherent coupling between synchronous and non-synchronous generation systems, with a focus on potential adverse effect due to their fundamentally different underlying physical principles. New discoveries in physical properties and dynamic couplings will be applied to provide a more accurate representation of system dynamics under low system strength conditions, revealing root causes of different instability phenomena. Expected outcomes include a suite of models for future electrical grids, improved knowledge about how renewable units respond to various system disturbance, a platform for dynamic simulation and novel tools for stability assessment. **National Interest Test Statement** A changing energy mix is creating new challenges for the efficient management of the Australia's power system. During this energy system transition, there is a major threat to power system operation due to system strength shortfall, that may trigger cascading failures and wide-spread blackouts in Australia. This project aims to provide significant benefits such as addressing key questions in power system stability assessment involving high amount of renewable generation. The project will provide new fundamental insights into the impacts of declining system strength in modern power grids, which is a previously unknown phenomenon, but a critical problem that applies to all power systems. The innovative breakthrough derived from this project, will provide the least cost system strength remediation scheme, ensuing generators survive more severe, lower probability non-credible contingency events. It will also provide additional guidance for regulators on introducing new generator performance standards, promote energy independence and sustainability, and eventually lead to a low-carbon economy in Australia.	223,520.00	223,520.00	218,710.00	223,020.00	888,770.00
FT200100427 Maclean, A/Prof Kama K	This project aims to apply the methods of Sound Studies to the history of anti-colonialism in India. Extending on earlier work which draws extensively on visual archives to construct historical narratives, this project aims to explicitly trace the reverberations of sound – especially mediated speech, slogans and song – in anti-colonial mobilisation in the interwar period. Orality was a critical element of political communication which, due to the difficulties in capturing the spoken word, has not yet been studied in detail; yet the archives are full of sound. The deeply affective qualities inherent in sound, and the growth of technologies to amplify and record them, renders this a rich approach to understanding anti-colonial politics. **National Interest Test Statement** This project represents ongoing Australian inquiry into Indian history and society, of which there is a long and strong tradition, creating positive links, scholarly output and understanding between the two countries at a time when both trade linkages and the Indian diaspora in Australia are growing exponentially. A great many classics in the historiography of Indian anticolonialism have been written by scholars based in Australia, known in the 1970s and 1980s as the 'Canberra School', which fed into one of the most significant developments in not only South Asian studies but Historical Studies more broadly: the Subaltern Studies project. The materials collected by these scholars still lie in public and private libraries across Australia, much of which will be harnessed for this project, reviving a fine and globally impactful scholarly tradition. The results of the study will prove to be illuminating not only to understand Indian history, but the vibrancy of contemporary Indian politics, which continues to draw on rich traditions of orality longstanding traditions of singing and sloganeering.	260,068.00	251,296.00	264,921.00	235,567.00	1,011,852.00
FT200100502 Bertran-Gonzalez, Dr Jay	Learning to strengthen behaviours that secure resources and warrant survival is one of the primary functions of the brain. This Project seeks to establish the rules that govern the integration of learning in brain reward systems by studying how neuronal circuits change their molecular signatures as animals assimilate new knowledge. These studies will combine novel experimental designs to investigate learning with multidisciplinary methods for mapping, recording and functionalising teaching signals in behaving mice. The outcomes will create a significant shift in our understanding of the neural bases that underlie reward learning, and will critically expand the field by providing a new model of learning integration in brain systems. **National Interest Test Statement** This project aims to increase our understanding of one of the primary functions of the brain - learning from external cues and information. How the brain responds to and accommodates new learning is one of the basic biological paradigms that underpins the field of artificial intelligence – where machines are trained to mimic basic human reasoning, learn from experience and adjust to new inputs. The outcomes of this research will be applied in the national interest to the design of better algorithms for machine learning which are critical for new generation analysis of large ramified datasets across multiple social and technological domains. Such advances will provide Australia with a competitive edge in the rapidly expanding field of machine learning, and our developing international reputation in both research and industrial settings.	236,159.00	224,897.00	226,923.00	224,423.00	912,402.00

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FT200100656 Johns, Prof Fleur E	Gaps and divergences in diplomatic understanding of global social, economic, and environmental conditions make coordinated international action difficult, especially in response to natural disasters. This project aims to shed light on how diplomatic and consular personnel come to know what they know about global conditions, how the information infrastructure with which diplomats work may inform (or impede) coordinated international legal action, and what could be done to make that information infrastructure more robust and less prone to blindspots. Expected outcomes include practical suggestions for diplomats, helping to strengthen Australia's capabilities in diplomacy, especially capacity to lead coordinated response to natural disasters. **National Interest Test Statement** It is in Australia's national interest that our capabilities in diplomacy adapt to a rapidly changing global information environment and challenges emergent within it, especially those surrounding natural disasters. Diplomatic capacity to rapidly and reliably assess environmental, economic and social conditions is essential to ensuring the safety of Australians and to exercising responsible leadership in disaster preparedness and response within our region, in order to help save lives and prevent or mitigate economic and environmental devastation. If the information-gathering practices in which diplomats and consular staff now engage exhibit bottlenecks, misplaced assumptions, distorting influences, recurrent blindspots or other problems – including those arising from recourse to new digital information sources – then these need to be understood and addressed. This project will generate precisely this kind of insight, providing Australian and other governments with an independent evidence base to inform improvement in diplomatic policies and practices for community benefit nationally and regionally.	224,341.00	254,932.00	240,866.00	231,332.00	951,471.00
FT200100707 Sharma, Dr Neeraj	This project aims to validate a new solid state synthetic route discovered in our group by understanding the reaction mechanism and experimenting with the parameter space of reaction variables. The discovery of a new solid state synthetic route opens up a world of possibility for the generation of new materials with a diverse range of potential functions and applications. The fundamental understanding of the reaction mechanism will enable the rapid and widespread use of this synthetic route. **National Interest Test Statement** Discovery of new solid state synthetic routes are very rare, and these routes typically enable the discovery of new compounds and phases. These phases can find use in a range of functional devices throughout society. The ability to easily make these phases underpins their eventual use. This route provides chemists a new way to make phases that might not have been accessible before and therefore the synthetic route is at the core of materials discovery. Australia has a vast abundance of natural resources and this new route may make it possible to both mine and generate valuable compounds and/or devices within Australia for export. This project is geared to fundamental understanding, enhancing our knowledge in the chemical sciences but the application of the synthetic route and the new materials generated can enable new materials-based industries and assist in the economic benefits to Australia. This would present opportunities for advanced materials and possibly device manufacturing.	229,101.00	227,601.00	227,601.00	235,101.00	919,404.00
FT200100798 Donald, Dr William A	This project aims to markedly improve the analysis of post-translational modifications (PTM) via intact protein mass spectrometry. Differences in the PTM forms of a protein (modforms) can be crucial in many physiological and metabolic processes. However, current conventional methods cannot accurately separate nor fully assign most protein modforms. A recent discovery has resulted in the ability to separate whole protein ions that have the same mass, charge, and collision cross section, but subtly different charge sites. This project aims to leverage this breakthrough by developing novel approaches for separating intact protein modforms and mapping PTM sites. This is expected to be important for future biological discovery. **National Interest Test Statement** Proteins are complex molecules encoded by genes that are involved in many biological processes. Most proteins are modified chemically at specific sites after formation in biological cells, tissues, organs and biofluids. Such modifications often occur at multiple sites, are involved in regulating biofunctions, and given their critical regulatory role, are commonly found to be disordered in many major diseases. However, the ability of scientists to confidently identify and quantify distinct protein forms that differ in their chemical modification forms remains challenging. This project will develop new methods to define proteins in higher detail than was previously possible. This will not only provide researchers with new tools for unravelling biological mechanisms, it will also open up new future avenues for the discovery of disease biomarkers.	227,101.00	225,601.00	226,101.00	233,101.00	911,904.00

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FT200100820 Russell, A/Prof Adrian R	This project aims to improve safety of tailings storage facilities (TSFs). Mineral processing produces waste called tailings, being mixtures of water and soil-sized particles. Tailings are stored on sites contained by embankments made from soil or a coarse component of tailings. Sections of the TSFs are partially saturated, have high concentrations of fine particles and physically change with age. Their resistance to earthquake loading and liquefaction, and strength post-earthquake, arising from these properties are poorly understood and can not be quantified reliably so will be addressed here. Anticipated outcomes will be updated industry guidelines for the design and management of TSFs. Mines will benefit and failures will be prevented.	260,000.00	260,000.00	260,000.00	260,000.00	1,040,000.00
	National Interest Test Statement Mining and mineral processing produces waste products called tailings, which are mixtures of water and soil-sized particles. Tailings are stored on sites contained by embankments made from soil or a coarse component of tailings. In Australia, tailings storage facilities (TSFs) comprise large sections which are partially saturated and aged, and have characteristics which are poorly understood, especially their ability to resist earthquakes and their strength reductions post-earthquake. This, and the large volume of tailings being stored, and the requirement that the TSFs must remain safe for 10,000 years, imposes a huge liability on the mining industry. Anticipated outcomes will be updated guidelines for the construction and management of Australia's TSFs, leading to improved safety and reduced risk to people, property and the environment.					
FT200100914 Danta, A/Prof Christopher	The future of AI is a site of considerable philosophical and cultural anxiety in the West. Given the future of AI is currently only available to publics through literary or fictional tropes, it is vital that we investigate the historical evolution of these literary or fictional tropes of AI to understand its future direction. This project aims to understand (1) how the post-Darwinian literary imagination has shaped our current anxieties about AI and (2) how literary and scientific writers after Darwin rethink the future of the human species by imagining the co-evolution of humans, animals and machines. Expected outcomes of the project include conceptual resources to understand the human-nonhuman relation and the future of AI.	240,000.00	230,000.00	235,000.00	225,000.00	930,000.00
	National Interest Test Statement The project delivers national benefit by putting current anxieties that machines will usurp human employment and autonomy into historical perspective. Literature is a vital but missing voice in the current discourse about how societies may evolve with the advent of AI. This project will broaden the debate about AI in both the Australian and international communities by demonstrating that an array of Australian and international literary writers shapes how we conceptualise and implement AI technology. It will contribute to the international renown of Australian scholarship in literary studies by producing the first literary prehistory of AI that examines the evolution of the literary imagination from the 19th to the 21st century. It will contribute to productive engagement between the Arts and Sciences in Australia by showing how literary representations of the human-machine interaction impact AI research and current theoretical debates about what it means to be human. Further, it will enhance our capacity to better understand and negotiate the unique and evolving place of AI in Australian society.					
FT200100928 McKay, Dr Matthew R	This project aims to develop a novel computational framework for solving parameter estimation problems in evolutionary modelling by leveraging genetic time-series data measured by Next-Generation Sequencing technologies. It will foster international collaboration, cutting across disciplines. By introducing new techniques from signal processing and tools from random matrix theory commonly employed for mobile wireless communications, it seeks to design scalable inference methods for resolving mutational fitness effects from genetic time-series measurements of complex evolving populations. This would enable new understanding of complex adaptive systems, such as pathogen evolution, host-immune dynamics, and acquisition of drug resistance.	277,241.00	277,241.00	277,241.00	249,632.00	1,081,355.00
	National Interest Test Statement The parameter estimation framework to be developed in this project could, in future work, enable a better understanding of the evolution of cancers, infectious diseases and other pathogens, in humans, livestock, and other species. This knowledge may be harnessed to inform novel intervention strategies; for example, to design rational methods for vaccine development. This could potentially reap large economic benefits by contributing to the billion-dollar vaccine industry. The results could also lead to significant social impact locally. For example, they may potentially be applied to genetic time-series data being collected from Hepatitis-C infected individuals in the NSW prison system, as part of a program being conducted at UNSW. Such a study could inform better prevention/treatment options.					
	The University of New South Wales	2,426,124.00	2,384,120.00	2,385,138.00	2,324,951.00	9,520,333.00

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The University of Sydney						
FT200100185 Muellner, Dr Markus	This project aims to produce disc-shaped polymer nanomaterials by utilising a new self-assembly concept based on oppositely charged polymers. This project expects to generate a modular technology that allows synthesis and control over the geometry and functionality of polymer nanoparticles. This level of control will permit a precise investigation of polymer nanodisc properties for nanomedicine applications. Expected outcomes of this project will be the fundamental understanding of how nanoparticle geometry affects particle-cell interaction and how nanoscale polymer discs can be used to mimic biological nanoparticles in shape and function.	224,101.00	224,101.00	227,101.00	234,351.00	909,654.00
	National Interest Test Statement Synthetic polymers find use in a wide range of environmental, energy and health applications. One biomedical application is the use of polymer nanoparticles as therapeutic carriers or agents to combat severe health conditions, such as atherosclerosis (hardening and narrowing of arteries). This project aims to address the persistent problem that two-dimensional polymer nanoparticles are difficult to synthesise and thereby limit the investigation and development of highly anticipated, disc-shaped polymer nanomedicines. The project outcomes grant significant progress in polymer nanoparticle synthesis control and are expected to aid the development of new and more effective polymer nanomedicines in order to improve their cellular interaction and enhance future treatment outcomes. The developed materials will have direct benefit for the nanomedicine and biomedical fields. This cutting-edge research will also strengthen Australia's position as a leader in polymer science, nanomaterials, and biomedical research.					
FT200100190 Kim, A/Prof Peter S	This project aims to mathematically model human evolution as a dynamical process. The anticipated goal is to quantitatively analyse theories of human origins. The project expects to develop innovative mathematical models, improve our understanding of the evolutionary process, and advance a unique area of interdisciplinary collaboration: applied mathematics and anthropology. Expected outcomes include refined methods for mathematical modelling of human evolution and improved techniques for analysing such models. It should provide benefits, such as increasing research in mathematical biology, an important growth area of science in Australia, and advancing mathematical approaches to engaging questions arising from anthropology.	259,332.00	261,332.00	264,332.00	243,537.00	1,028,533.00
	National Interest Test Statement "My project will advance connections between mathematics and the study of human origins and interactions, facilitating cost-effective breakthroughs across disciplines. The mathematical models developed in this project will help us better understand the Australian environment. Specifically, advances in mathematical biology will enable scientists to model and explain the unique nature of our environment, its people and fauna in new, innovative ways. Mathematical modelling in social science presents a new frontier and my project will promote Australia's leadership in this emerging area. My work will attract students, overseas funders and esteem by establishing a world-leading research community for mathematical modelling of human evolution. My project bridges fields that have traditionally not benefitted from the intellectual developments of the other. It will contribute to training a new kind of interdisciplinary thinker with potential to uniquely deepen the culture of Australian academia and industry."					
FT200100346 High, Dr Holly H	This project aims to provide an anthropology of procreation and parenting through ethnography of the Government of Laos' Reproductive, Maternal, Newborn, and Child Health rollout as well as everyday reproduction in rural and remote Laos. It expects to generate new knowledge of core values in Laos, including those underpinning official treatment of children as human capital, difference as deprivation, and mother-and-child biomedical care as universal, as well as the (counter-)values lived in rural and remote practices, knowledge and sentiments. Anticipated benefits include advanced understandings of Lao culture and society, socialism as it articulates with international health and economic agendas, and the anthropology of human flourishing.	245,300.00	212,900.00	231,800.00	232,400.00	922,400.00
	National Interest Test Statement Contextualising the Reproductive, Maternal, Newborn and Child Health (RMNCH) strategy within an ethnography of everyday lives in rural and remote Laos; Lao history, politics and economy; and local values, will advance knowledge of Lao cultural dynamics, which is important given Laos' role in Australia's region. It will also contribute to the Australian Science and Research Priority on health, particularly the Practical Research Challenges of improving models of health care and understanding regional health threats. One of the greatest challenges to RMNCH in Laos, to international initiatives such as the Sustainable Development Goals, and to Australia's efforts towards this sector in Laos, is the translation from policy to practice. This project will observe and analyse RMNCH strategies at the point of implementation, and from the perspective of rural and remote intended beneficiaries. This is essential for understanding national, bilateral and global initiatives holistically. It is also relevant for Australia's biosecurity interests, in that infectious disease is a key target in RMNCH strategies.					

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FT200100464 Faulkner, Dr Patrick A	How did humans adapt to environmental change in the past? This project aims to address this question by examining the evidence provided by archaeological shell assemblages, a frequently overlooked residue of human habitation patterns. Deploying a range of high-resolution ecological and chemical techniques, this project aims to investigate changes in human behaviour, diet and landscape in one region through time and space. The expected outcomes of this project will enhance our understanding of early human movement through South Asia into Australasia and generate new knowledge regarding the course of human adaptation to environmental change	245,521.00	244,502.00	248,892.00	217,162.00	956,077.00
	National Interest Test Statement This project will increase our understanding of human-environmental interactions in past ecosystems in South Asia. It will generate new knowledge about human dispersal and resource use from a combination of archaeological and scientific methods. Understanding how humans responded to shifting environmental conditions in the past has the potential to inform current research predictions as to how populations living in environmentally impacted areas today may adapt. The long-term perspective afforded by applied archaeological research into human-environmental interactions will provide a number of social and economic benefits for Australian and international communities currently facing uncertainty in this area. It will also augment existing collaborative research ties between Australia and Sri Lanka, including training and skills-development for established and emerging researchers					
FT200100539 Phillips, A/Prof Sarah G	How do terrorist groups adapt in the face of counterterrorism measures and sustain themselves despite their lack of local popularity? This project answers this question through a systematic analysis of how local observers understand extremist groups in four states facing significant terrorist activities: Yemen, Iraq, Pakistan, and Somalia. This comparative analysis will provide an opportunity to assess local knowledge as a form of resistance to terrorism, thereby generating new approaches to conceptualising and countering violent extremism. Other expected outcomes include new collaborative research networks between Australia and conflict-affected states, the creation of new datasets for researchers, and training for research students.	243,900.00	249,200.00	256,700.00	256,700.00	1,006,500.00
	National Interest Test Statement Security and counter-terrorism are top national priorities for Australia, as demonstrated by the increasing budgetary allocations for intelligence and law enforcement over the next four years. By producing new knowledge about the resilience of terrorist groups in Yemen, Iraq, Pakistan and Somalia, this project seeks to support Australia's contributions to global counter-terrorism efforts. It also offers a novel approach to Australia's National Counter-Terrorism Plan and its goal of "challenging terrorist propaganda" by empowering community voices that already counter extremist narratives. These are areas of acute interest to Australia's most important allies and coalition partners. This project also seeks to enhance collaborations with research institutes in the Middle East that will build Australia's research capacity, foster networks between Australian and Middle Eastern researchers, organisations, and policymakers, and deliver PhD training to Australians from conflict-affected states or refugee backgrounds.					
FT200100809 MacKenzie, Prof Megan	Military sexual violence, or sexual violence that occurs within national militaries, is a complex and gendered international problem This project addresses how we can better understand and reduce military sexual violence through a comparative analysis of the rates, responses, and reporting of the issue in Australia, Canada, the US, and New Zealand. The project will produce the first-ever comparative data set on international rates over the past decade, establish and communicate international best practices and policies in reducing military sexual violence, and identify potential gender bias within media coverage and policies that may limit public knowledge and responses.	260,332.00	264,332.00	264,332.00	263,332.00	1,052,328.00
	National Interest Test Statement This research will advance knowledge and contribute to efforts in reducing military sexual violence. This research directly addresses the Australian government science and research priority of 'health'. Military sexual violence poses a direct threat to the health and well-being of military personnel, and research points to a number of related health implications of exposure to military sexual violence. Military sexual violence has been shown to have extensive negative social and economic impacts, including reputational damage, a decreased ability of defence forces to recruit and retain women, and related financial costs for military institutions. Australia has demonstrated international leadership with regard to addressing military sexual violence and this project will place recent local policy developments in a global context to draw out international best practices in reducing military sexual violence.					

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FT200100871 Huber, Asst Prof Daniel	The NASA space missions Kepler, K2 and TESS have revolutionized astronomy over the past decade through the discovery of thousands of planets orbiting other stars. This project will for the first time combine the data from these missions to perform a homogeneous all-sky characterization of exoplanets and their host stars, and perform follow-up observations using ground-based telescopes to precisely determine masses and architectures of exoplanet systems. The expected outcomes include the first insights into how the radius distribution of small exoplanets varies among different populations of stars in our Galaxy, and breakthrough discoveries into the formation, composition, and evolution of giant exoplanets. **National Interest Test Statement** The study of planets outside our solar system is one of the fastest growing fields in astronomy and has been awarded the 2019 Nobel Prize in Physics. This project will establish a leading research group for exoplanet science at the University of Sydney, attracting young Australians to take up careers in science and technology and strengthening Australia's leadership role in answering one of the most fundamental questions in humanity: Are we alone? By training Australian students in the use of data obtained by NASA space missions and state-of-the-art ground-based telescopes, the project will support key national strategic investments such as the Australian Space Agency and the partnership with the European Southern Observatory. The project will establish close international ties with world-leading institutions such as the California Institute of Technology, the Massachusetts Institute of Technology and the University of Birmingham, fostering visits by world leaders in astronomy to Australia, and promoting the exchange of knowledge and the development of collaborations with local Australian scientists.	187,863.00	182,863.00	177,863.00	181,863.00	730,452.00
	The University of Sydney	1,666,349.00	1,639,230.00	1,671,020.00	1,629,345.00	6,605,944.00
University of Technology Sydney						
FT200100264 Wang, Dr Qilin	The project aims to address 3 long-standing problems and an emerging problem for wastewater systems by developing a suite of innovative technologies for microbial control. These will use a renewable material from wastewater. The project expects to advance understanding of microbiology to improve processes for removing phosphorus, managing sludge bulking, cleaning membranes, and reducing the spread of antibiotic resistance. Expected outcomes include substantial cost reduction, a secure resource future, and elimination of the need to use chemicals that present safety risks to workers and the environment. The project should benefit public health, the environment and the water industry, as well as create commercial opportunities in Australia. **National Interest Test Statement** The project will contribute solutions in an area of priority for Australia—minimising damage to soil and water. It will develop a suite of innovative technologies that will reduce the operating costs of wastewater treatment plants, reduce safety risks to workers and the environment from conventional chemical treatment, and improve the effectiveness of key treatment processes. It will thus address long-standing operational problems around removing phosphorus, managing sludge bulking, and cleaning membranes. It will also benefit public health—beyond the existing benefits offered by wastewater treatment—by addressing the emerging problem of antibiotic resistance genes in sludge. Treated sludge from wastewater is reused as a soil conditioner. A problem has arisen because we now know that sludge is a reservoir of antibiotic resistance genes and these therefore need to be reduced in sludge before it is reused. The project's technology centres on a renewable material obtained from wastewater, helping drive a circular economy while also creating jobs through commercialisation opportunities.	220,000.00	220,000.00	220,000.00	220,000.00	880,000.00
FT200100787 Qin, Dr Lu	This project aims to develop efficient and scalable algorithms to process large-volume dynamic graphs in the cloud. The project expects to address key challenges and lay theoretical foundations in large-volume dynamic graph processing, which plays an important role in developing general-purpose, real-time structural search engines. Expected outcomes of this project include theoretical foundations and scalable algorithms to process big graphs that evolve rapidly over time. These enable users to monitor and analyse structural information in large dynamic networks in real time. The project expects to open up a new research direction for graph processing to enrich frontier technologies and benefit many key applications in Australia.	220,000.00	220,000.00	220,000.00	191,101.00	851,101.00

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	National Interest Test Statement This project will develop effective and innovative solutions for large-volume dynamic graph processing in the cloud, which is in high demand for many data-intensive applications in Australia including social network analysis, cybersecurity, real-time web searching, crime monitoring, e-marketing, and online recommendation systems. The delivered theoretical foundations and frontier technologies will enhance Australian's competitiveness in this important research field. By developing new foundational techniques for the next-generation of structural knowledge database systems, the outcomes of this project are expected to unlock the power of large-volume dynamic graph processing and facilitate key breakthroughs in Big Data analytics, which will benefit both the economy and society in Australia. The industrial collaboration established in this project will also benefit local industry. The participants trained in this project will enrich the pool of professionals for data science in Australia.					
FT200100844 Mahmoodian, Dr Sahand	In recent years, scientists have realised unprecedented control over light-matter interaction. Single particle dynamics in engineered systems are now well understood, but when scaled up, the many-body behaviour remains unexplored. This project will significantly advance our understanding of new emergent quantum phenomena arising from engineered interactions between many particles. These phenomena are qualitatively new behaviour that cannot be explained as an extension of single-particle behaviour. The chief aim is to unravel the quantum dynamics of these systems. The project is expected to assist in producing new quantum technologies such as sources and detectors of quantum light and new atomic clocks.	188,863.00	196,863.00	195,863.00	199,863.00	781,452.00
	National Interest Test Statement Australia has a history of world-leading innovation and investment in quantum technologies that have potential applications across many sectors such as security, transport, and finance. These can impact Australia's commercial sector and position Australia at the forefront of the global economy. The project will build a path towards new technologies by exploring large-scale interacting quantum systems. It will provide new schemes for developing sources and detectors of quantum light and help improve the accuracy of atomic clocks. Such devices are key ingredients for the next generation of high-value technologies such as quantum-enhanced sensors and secure quantum networks. In addition, quantum information is listed as one of the target sectors of the Australian Government's Global Talent Independent Program, aiming to attract professionals of this high-growth sector. This project will help fulfil the goal of this program by recruiting home an expert in this field who will help educate and train the next generation of quantum engineers helping Australia become the centre of the hi-tech quantum industry.					
	University of Technology Sydney	628,863.00	636,863.00	635,863.00	610,964.00	2,512,553.00
University of Wollongong						
FT200100006 Atchison, Dr Jennifer M	This project aims to investigate how rapid socio-ecological transformation in northern Australia is reconfiguring invasive plant management, and evaluate the social and cultural factors and development context that contributes to its effectiveness. Through innovative qualitative research, the project will generate new knowledge of plant introductions, the emerging assemblages of people and practices that are facilitating or disrupting change, and the consequences for Indigenous people dealing with land-use change. Expected outcomes include enhancing Australia's environmental management capacity by identifying opportunities for more effective invasive plant management, and more equitable and sustainable sharing of the benefits it brings.	233,983.00	233,411.00	235,750.00	230,904.00	934,048.00
	National Interest Test Statement The project aims to provide comprehensive new social and cultural knowledge of the legacies, threats and opportunities of invasive plant management in northern Australia. It will benefit the Australian community across northern Australia through the synthesis of historical and contemporary information of plant introductions, and by generating new empirical data of plant management. It will contribute to improved weed policy in the mobile pasture production (hay), agro-forestry and peri-urban horticultural industries, and in the context of Indigenous environmental management. Stakeholder and community participation throughout the project will enhance translation of the new research knowledge into decision making at all levels. The anticipated outcomes will benefit environmental management by identifying opportunities for more effective invasive plant management. Local and national communities will benefit through the identification of risks and benefits arising from invasive plant management, so that more socially just outcomes can be realised.					
	University of Wollongong	233,983.00	233,411.00	235,750.00	230,904.00	934,048.00
	New South Wales	5,885,185.00	5,831,807.00	5,881,507.00	5,725,147.00	23,323,646.00

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Queensland						
Griffith University						
FT200100015 Zhong, Dr Yu Lin	This project aims to produce value-added functional 2D nanomaterials by advancing the green, scalable and cost-effective electrochemical production method developed by the candidate. In addition to developing transformational electrochemical engineering technology to utilise Australian raw resources, this project will generate new knowledge in the area of materials chemistry and innovative additive manufacturing technology. Expected outcomes of this project include improved pilot-scale electrochemical reactors for producing various functional 2D nanomaterials and enabling precise control of their molecular and bulk properties. These tailored 2D nanomaterials will significantly improve the performances of flexible and energy-related devices. **National Interest Test Statement** The electrochemical production and engineering of functional 2D nanomaterials is an environmentally friendly, scalable and cost-effective method that will facilitate the eventual commercialisation of 2D nanomaterials. Moreover, the niche applications of these functional 2D nanomaterials in energy storage, energy conversion and flexible electronic devices, assisted via the precise fabrication controls in additive manufacturing technology, will greatly add value and increase demand for Australian raw resources. Ultimately, the advent of these patentable advanced production and manufacturing technologies will catalyse the technological development of many other application areas such as biosensing and health monitoring. This project will directly support the growth of Australian high-tech companies, which are the cornerstones in sustaining a strong economy, by providing the home-grown technological advances and training of the future resilient research and development scientists.	223,490.00	223,490.00	223,490.00	195,881.00	866,351.00
FT200100390 Smith, Prof Tanya M	This project aims to investigate prehistoric human population growth by documenting nursing behaviour, developmental stress, and fine-scaled climate variation directly from the teeth of ancient children. Knowledge of the nexus of early childhood growth and ecological variation will shed light on modern human health and fertility, which in turn impact planetary health. Outcomes will provide further insight into humanity's unprecedented evolutionary success while augmenting multidisciplinary collaborative networks. This will further strengthen Australia's pioneering role in the development of innovative technologies, and build key workforce capabilities of benefit for diverse fields such as public health and environmental science. **National Interest Test Statement** This investigation of prehistoric population growth by documenting nursing behaviour and developmental stress from the teeth of ancient children will improve our understanding of modern human health and fertility. The outcomes will provide further insight into humanity's unprecedented evolutionary success, including by relating dietary choices to lifelong health outcomes during periods of environmental change. Public health recommendations on nursing practices that optimise infant growth and development may be further underpinned by the deeper knowledge gained. Our innovative interdisciplinary approach uses chemical analyses pioneered by Australian scholars and builds scientific workforce capacity in a field of growing international significance. This includes highlighting how the analysis of elements in teeth may advance the identification of childhood exposure to environmental toxins. Broader national benefits arise from opening up new opportunities for probing the impacts of cultural transitions, reconstructing fine-scaled climate variation and exploring Indigenous Australians' prehistory.	276,282.00	276,332.00	264,332.00	258,782.00	1,075,728.00
FT200100495 Bartleet, Prof Brydie-Leigh	This project aims to investigate the role community music can play in addressing social inequalities in Australia. The research expects to map and analyse a range of social outcomes fostered by community music, and investigate how these outcomes can enrich current place-based efforts to address social disadvantage. Through national sector mapping, community case studies, and an innovative analytic framework, expected outcomes include new interdisciplinary knowledge, music and social sector development, and greater creativity in place-based policies tackling inequalities. This should provide significant benefits for Australian communities where social inequalities exist, by harnessing their creative assets to drive positive social change.	224,332.00	279,550.00	279,550.00	279,550.00	1,062,982.00

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	National Interest Test Statement Social inequalities are on the rise in Australia. Despite increased government spending, problems of long-term disadvantage persist in Australian communities. There are growing calls for place-based approaches that bring together diverse stakeholders and sectors to work collectively on addressing these inequalities. This Fellowship will advance our understanding of the role that community music can play in these tailored, community-based approaches. Building on a mounting evidence-base of research that documents the social, cultural, physiological and economic benefits that can come from participating in community music, it seeks to examine whether these positive outcomes can lead to the kinds of individual, community, and systemic changes needed for greater social equality to occur. This knowledge will improve the reach and impact of the Australian music sector, bring a 'creative turn' to the social sector's design and implementation of collective initiatives targeting inequalities, and enhance the efficacy of these efforts. It will also inform future government efforts to formulate place-based policies.					
FT200100572 Ve, Dr Thomas	Nicotinamide adenine dinucleotide (NAD+) dependent signalling pathways play important roles in neurodegenerative diseases and bacterial defence systems, and are therefore potential targets for the development of new therapeutics and biotechnology tools. This project aims to increase our understanding of the biology of a novel class of enzymes involved in NAD+ signalling across the domains of life. The project is expected to unravel general principles of nucleotide-based signalling, and the expected outcomes will include new molecular mechanisms relevant to cell-death and pathogen defence in mammalian and bacterial systems, which should provide significant benefit for a range of applications in human biology and biotechnology.	203,363.00	207,863.00	203,863.00	203,863.00	818,952.00
	National Interest Test Statement This project aims at a breakthrough in our understanding of the biology of a novel class of enzymes involved in nicotinamide adenine dinucleotide (NAD+) dependent signalling across the domains of life. This project will enable advancements of scientific outcomes to improve our understanding of nucleotide-based signalling mechanisms in biological processes throughout nature, including human disease processes and bacterial defence systems, which may provide the basis for future work on drugs to combat a range of neurodegenerative diseases and expand the currently available molecular and chemical biology toolkits for biotechnology applications; thus providing economic, commercial and societal benefits. This project will develop new national and international collaborative links and will provide an excellent, multidisciplinary environment for training the next generation of researchers to solve problems in the increasingly complex field of life science.					
	Griffith University	927,467.00	987,235.00	971,235.00	938,076.00	3,824,013.00
Queensland University of Technology						
FT200100446 Sauret, Dr Emilie	The miniaturisation of chemical and biological processes requires microfluidic tools for the precise manipulation of complex fluids at the microscale. This project aims to integrate new computational methods that enable unprecedented control over the design and optimisation of these tools. The project will deliver a cornerstone framework to elucidate the complex microscopic fluid physics that currently poses a challenge for the advancement of microfluidic technologies. The outcomes of this project will establish physical principles to guide the design of microfluidic systems and provide the computational capabilities that can potentially transform the way researchers and engineers design, optimise and use microfluidic technologies.	210,000.00	230,000.00	230,000.00	230,000.00	900,000.00
	National Interest Test Statement This project will address the lack of knowledge in physics of fluids in the microscale and computational challenges that curtail the practical design and optimisation of microfluidic technologies. The project is expected to integrate advanced computational methods into an innovative framework and to make significant impact on the optimisation of low-cost microfluidic tools. The project aims to generate new knowledge on complex fluid physics underpinning current microfluidic technologies. The highly efficient and affordable computational design tools will benefit chemical, pharmaceutical and biological industries by greatly facilitating the development and application of novel microfluidic technologies. The cutting-edge computational methods are expected to lead Australia to an international leadership position and to add value to its economy, in particular to the fast-growing Asia-Pacific markets for microfluidics and advanced manufacturing. The outcome will ultimately provide Australian industries the basis for high-quality jobs, sustained competitiveness, and a definite advantage on the world stage.					
	Queensland University of Technology	210,000.00	230,000.00	230,000.00	230,000.00	900,000.00

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The University of Queensland						
FT200100096 Rhodes, A/Prof Jonathan R	This project aims to improve knowledge of the implications of global flows of ecosystem services (the benefits people receive from nature) for achieving sustainable land use by developing novel predictive models and decision tools. The project is significant because it will resolve the complex challenge of assessing land use strategies when land use change has impacts on ecosystem service provision locally and globally. Expected outcomes will be new evidence for the effect of land use change on the global distribution of ecosystem service benefits and how ecosystem services trade-off against each other. This should provide significant benefits by enabling better assessment of land use policy in an increasingly highly connected world.	262,290.00	261,744.00	263,164.00	254,140.00	1,041,338.00
	National Interest Test Statement Australia's economy, society, and natural systems are highly connected to the rest of the world through trade, information flow, and the movement of biophysical material. Flows of ecosystem services to and from Australia are therefore major drivers of the enormous benefits Australian's receive from nature (e.g., through agriculture, fisheries, and nature-based tourism). Better understanding of how land use change, within and external to Australia, influences these flows of ecosystem services is critical for informing land use policy to ensure the country's long term prosperity. This project will contribute to this by developing new tools to inform land use policy in a highly connected world and directly address the Australian Government's priorities for research to guide sustainable development to meet the UN's Sustainable Development Goals. The project has the potential to generate significant economic, environmental, and social benefits through a new interdisciplinary ecosystem service approach to sustainable land use policy across broad regions.					
FT200100169 Ortiz-Barrientos, A/Prof Daniel	Darwin believed that natural selection drove the origin of new species, or speciation. However, research on speciation during the 20th century shifted focus from studying adaptation within a population to examining the causes of reproductive isolation (lack of interbreeding) between populations. This Project aims to unify our understanding of adaptation and reproductive isolation by examining their shared heredity. Using an established system in natural conditions, this project will generate new knowledge on the genetic processes driving speciation. This interdisciplinary research will clarify how biodiversity originates with implications for crops, conservation biology and species responses to environmental change.	269,650.00	273,190.00	266,000.00	266,332.00	1,075,172.00
	National Interest Test Statement This project will reveal how the evolution of plant shape affects the viability and fertility of Australian native plants. By focusing on unique Australian flora adapted to our extreme dry and saline soils, the project outcomes will deepen our understanding of how to safe-guard Australian biodiversity as these conditions become more prevalent across states and territories. This project will help explain how plants have been able to colonise extreme environments in the past, thus informing how plants will respond to future global environmental changes in Australia and abroad. The project will develop trans-disciplinary researchers in ecology, genetics and evolution necessary to create the skilled workforce required to help preserve Australia's unique flora, while taking Australia to the global forefront of evolutionary biology.					
FT200100179 Crowther, Dr Alison	This project aims to apply a multi-analytical archaeological science approach to investigate how cross-cultural interaction transformed peoples, societies and environments in the Indian Ocean. It plans to trace the movement of people, plants, animals, goods and practices to Madagascar and the Comoros over 1000 years ago in order to critically assess evidence for early long-distance contacts between Southeast Asia and Africa. The project seeks to enhance Australia's capacity for archaeological science and deliver significant social and cultural benefits by shedding light on the history of the diverse but interconnected Indo-Pacific world in which Australia now occupies a central geopolitical position.	205,859.00	204,220.00	217,852.00	212,842.00	840,773.00
	National Interest Test Statement Home to 35% of the world's population and the birthplace of 24% of Australia's migrants, the Indian Ocean is a strategic cultural, economic and geopolitical nexus between Australia, Asia and Africa. In response to shifts in global political and economic relations, the Australian Government has highlighted the need to strengthen strategic ties with our Indian Ocean neighbours. This project advances this national priority by developing and expanding Australia's scientific and cultural cooperation with two Indian Ocean nations, leading to improved outcomes in education and employment for domestic and international participants, and building development capacity in Africa for global heritage and tourism. These activities will help create sustainable long-term relationships with Indian Ocean nations; build a stronger and more resilient neighbourhood for Australia; raise public awareness of global cultural diversity and its relevance to our multicultural identity; and enhance our international leadership in scientific research on the long-term cultural, environmental and biosecurity outcomes of globalisation.					

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FT200100188 Round, Dr Erich R	Linguists are able to infer ancient histories of languages by a procedure known as the Comparative Method. Its results are used in related studies of human genetic and cultural change. However, the Comparative Method is a manual-only process and thus currently is a bottleneck for the science of unravelling the human past. This project aims to overcome this limitation and significantly accelerate linguistic discovery, by combining recent advances in computational language processing, statistics and cultural-evolutionary modelling. By producing innovative mathematical means for rapidly discovering ancient language relationships, it will enable a breakthrough in our capacity to uncover human linguistic, genetic and cultural heritage worldwide. **National Interest Test Statement** Australia is custodian to some of the most ancient continuous cultures on earth, and more recently the beneficiary of rich cultural and linguistic contributions from around the world. This project aims to significantly accelerate our technical ability to discover the ancient histories of languages, and through them, networks of cultural relationships stretching back into the unrecorded past. Increasing our understanding of major patterns of history in this scientific manner can help us to contextualise more specific debates around diversity and identity, which Australian society grapples with. By a more indirect path, language histories are used by geneticists to calibrate and interpret research on genetic histories. As genetic research enters more of our lives, having better language histories will contribute to improved insights also into our genetic diversity.	242,000.00	233,000.00	242,000.00	233,000.00	950,000.00
FT200100279 Luo, Dr Bin	This project aims to develop a new solar battery as a sustainable power source for future wearable electronics. The research will develop solar rechargeable Zinc-Manganese oxide batteries based on new stretchable microelectrodes and materials engineering for the direct storage of solar energy. Expected outcomes include new classes of planar-type solar batteries, functional microelectrodes and energy materials, as well as new knowledge generated from collaborations across materials science, photoelectrochemistry and nanotechnology disciplines. These will not only expand the applications of solar batteries to a new domain of wearable electronics, but also may eventually lead to new industry advances in functional materials for clean energy. **National Interest Test Statement** The lack of sustainable and stretchable power sources is a key bottleneck in the development of next-generation wearable electronics. The successful development of high performance solar rechargeable energy storage systems could therefore have a considerable economic impact for Australia's electronics sector, enabling development of new devices and applications not available in the current market, and putting Australia at the forefront of wearable and sustainable electronics. The project is expected to result in a new class of flexible microelectrodes, which is expected to lay the groundwork for other energy-related and nanotechnology applications including photodetectors, microsupercapacitors and chemical- or bio-sensors, further stimulating the development of future sustainable energy and wearable electronics.	204,722.00	204,522.00	204,322.00	176,913.00	790,479.00
FT200100314 Klein, Dr Carissa J	This project aims to improve the social and environmental sustainability of wild caught seafood globally. This project expects to generate new knowledge in the area of seafood trade and sustainability using interdisciplinary approaches that account for social sustainability concepts and the displacement of fishing impacts. Expected outcomes include innovative approaches that can improve the traceability and sustainability of seafood and new international collaborations. This should provide significant benefits to the ocean, by proposing innovative ways for protecting the ocean through improving the sustainability of trade policies, and to the billions of people that depend on a healthy ocean for their health and livelihood. **National Interest Test Statement** This project will provide Australia with new strategies for becoming a global leader in the production and consumption of sustainable seafood, core to Australia's Science & Research Priorities and Fisheries Policy, and United Nations 2030 Sustainable Development Goals, to which Australia subscribes. This project will equip governments, the seafood industry, and the environmental not-for-profit sector with a framework for improving the social and environmental sustainability of seafood. Novel insights into the global impacts of international fishing and trade will enable us to meet rising seafood demand while avoiding perverse social and environmental outcomes from local environmental policies. Improving seafood sustainability in Australia will deliver benefits to the ocean and the people it supports worldwide.	250,966.00	241,081.00	243,955.00	209,460.00	945,462.00

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FT200100329 Cloos, Asst Prof Martijn A	This project aims to advance our understanding of the poorly understood neural circuits that enable fine motor control in humans. To obtain this knowledge, new platform technology will be developed to capture the full kinematics of the hand during concurrent functional magnetic resonance imaging at ultra high-field. This device will allow testing of fundamental theories describing the canonical microcircuits involved in hand motion. Expected outcomes include new evidence of mirror neurons and observation of predictive error signals in the motor cortex. This new knowledge paves the way towards improved computer-brain interface technology which is likely to create benefits through translation to applications such as artificial limb control. **National Interest Test Statement** Precise control of the hand plays an essential role in everyday life, yet we know little about how the brain accomplishes this feat. This project delivers new technology that enables functional Magnetic Resonance Imaging (MRI) to study how the human brain controls hand motion. For the first time, it will become possible to decode how the human brain implements fine motor control tasks, such as grasping objects. Establishment of a new research group in this area will create training and career opportunities for Australian scientists in the new technology that will be invented. The resulting research platform will greatly enhance the capability of functional MRI and help unlock the full potential of Australia's most powerful human MRI instruments. The knowledge discovered will have lasting benefits for neuroscience, imaging, and biomedical engineering. Economic and social benefits are expected through translation into new technologies, such as improved computer-brain interfaces, that will enhance socioeconomic participation of disabled Australians and generate new high-tech Australian businesses.	221,101.00	221,101.00	221,101.00	221,101.00	884,404.00
FT200100613 Hameiri, A/Prof Shahar	This Fellowship aims to investigate why, when and how recipient states decide to accept international development financing from certain states and not others. Intensifying competition between provider states is hindering providers' capacity to achieve intended policy goals, despite spending vast sums. This is the only study to explain which groups in recipient countries prefer particular providers, why, and which group's interests are likely to prevail. It expects to develop enhanced research and policy capacity to analyse and engage effectively in competitive environments. This should significantly improve Australian international development financing's outcomes and help recipient states obtain financing that meets their needs. **National Interest Test Statement** Australia spends billions of dollars on international development financing, however the emergence of major new providers, particularly China, has rendered Australia's conventional aid policies and delivery modalities unfit for purpose. Unless Australian policymakers learn to operate in this new competitive environment billions of dollars are likely to be wasted without achieving the intended foreign policy, developmental and humanitarian goals. This Future Fellowship therefore addresses a critical policy need by developing a new approach for analysing why recipient states choose to receive international development financing from one provider and not another. The aim is to secure Australia's long-term capacity to provide cost-effective international development financing that achieves desired foreign policy and developmental goals. The Fellowship focuses on Asia and the Pacific, where the bulk of Australian development financing is delivered and where the benefits of optimising engagement for the Australian national interest are greatest.	255,302.00	252,097.00	247,497.00	250,323.00	1,005,219.00
FT200100837 McRae, Dr Allan F	This project aims to address knowledge gaps in our understanding of the genetic and environmental control of complex human trait variation. This project will use innovative approaches that combine molecular genomic information with data from large biobank sized cohorts to generate new knowledge of the mechanisms underlying ancestral and sex differences in humans. Expected outcomes include the development of novel methods for the integrative analysis of genomic data and building Australia's capacity in a highly demanded field, ensuring the capability to realise the translation of this knowledge to positively impact society and human well-being. **National Interest Test Statement** Biological sciences are undergoing a "big data" revolution, driven by new genomic technologies. Similar to the explosion of data in other fields (such as information technology) genomic data is driving new industries and economic growth, particularly in the biopharmaceutical and biotechnology arenas. This proposal builds Australia's capacity in statistical genomics and train new researchers in the cross-disciplinary field of genomic analysis. The expected outcomes of this research will broaden our understanding of the differences and similarities across ancestral groups and between males and females, which will ultimately contribute to the construction individual-level predictors that will enable taking genomics from the fundamental research space to clinical applications, enabling better outcomes across and individual's lifespan. Further, most of the approaches to understanding phenotypic variation developed in this Fellowship are applicable in plant and animal contexts, significantly widening the benefit and impact of the project.	210,000.00	210,000.00	210,000.00	210,000.00	840,000.00

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FT200100843 Taubert, Dr Jessica A	Selecting where to look is a necessary step in human vision that is vital for guiding social behaviours. For example, although we inadvertently look toward faces in our environment, especially faces expressing emotion, we do not know how this is accomplished. This project aims to define the mechanisms responsible for detecting and prioritising faces in the human brain. The results are expected to advance our understanding of how vision operates in daily life, and augment theories of how the prioritisation of social cues might differ in people living with Anxiety disorders. It is anticipated that the project outcomes will also inform the development of artificial vision systems that can interpret social meaning in visual environments. **National Interest Test Statement** This project will examine what brain structures are responsible for controlling gaze, including the abnormal patterns that relate to social dysfunction in anxiety-related Post-Traumatic Stress Disorder (PTSD). The project will create new opportunities in brain and vision research through collaboration with some of the worlds' leading systems-neuroscientists. This will cement Australia's position at the forefront of systems neuroscience, and build capacity in vision and brain research by enabling the training of junior Australian scientists. There is potential to inform cutting edge and emerging biotechnologies, for defence and other industries where innovation in artificial and augmented vision systems will play a critical role in advancing Australia's interests. The project has long-term potential to benefit distressed Australians, including returned soldiers and other first responders, by enhancing their functioning in daily life, thereby generating social and economic benefits.	232,460.00	250,616.00	233,278.00	227,651.00	944,005.00
FT200100899 White, Dr Melanie D	This Project aims to understand the formation of the neural tube; a fundamental tissue structure that generates the brain and the spinal cord. Using interdisciplinary approaches and exploiting recent advances in transgenic and imaging technologies, the Project expects to reveal the complex interplay of molecular, cellular and mechanical processes that direct neural tissue formation and cell fate specification. Outcomes from the Project include knowledge of previously intractable developmental processes, training of future scientists and development of international collaborations. This should provide enhanced imaging capacity, a higher quality scientific workforce and position Australia at the forefront of developmental biology. **National Interest Test Statement** This project will strengthen Australia's capacity to generate innovative and internationally competitive research through multiple avenues. It contributes to the development and innovation of Australian-based imaging technology and cell and developmental biology. It will ensure future generations of scientists are trained at a globally competitive level in quantitative imaging and image analysis technologies. The research findings will drive our understanding of how cells form the foundations of the nervous system and how their cell fate is specified. They will also reveal how mechanical forces are integrated at a cellular and tissue level with morphological and signalling processes common to many biological contexts beyond development. This knowledge will be valuable for research in many biological fields and also future industry related applications such as tissue engineering and cell replacement approaches.	207,863.00	202,863.00	202,863.00	197,863.00	811,452.00
	The University of Queensland	2,562,213.00	2,554,434.00	2,552,032.00	2,459,625.00	10,128,304.00
University of the Sunshine Coast						
FT200100192 Frere, Dr Celine H	This project aims to improve knowledge about the central role that animal social behaviour plays in the spread of emerging infectious fungal diseases in nature. Applying approaches from behavioural ecology, network modelling and quantitative genetics, and utilising rare empirical pre- and post-infection data, the project expects to generate new understandings about how fungal diseases spread through animal populations, how animal social behaviour influences disease transmission, and how disease-status affects animal social behaviour. This project should have international impact, and advance current knowledge about disease dynamics. Applied outcomes should inform much-needed control strategies to benefit wildlife and preserve biodiversity.	247,942.00	251,101.00	248,841.00	219,555.00	967,439.00

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	National Interest Test Statement					
	An emerging infectious fungal disease, previously confined to captive reptiles in Australia, has recently been found in a growing number of free-living animals, posing an urgent risk to the nation's wildlife - in particular its reptiles. By focusing on one of the affected populations as a case study, this project seeks to increase fundamental knowledge about the infection patterns of fungal diseases in animal populations, and usher in new advances about the central role that animal social behaviour plays in the spread of such diseases. It will position Australia at the forefront of interdisciplinary progress against the significant environmental challenge which these diseases pose and underwrite new international collaborations for a regional Australian university, thus boosting both regional and national research capacity. Applied outcomes could be rapidly leveraged to guide much-needed control strategies, benefiting conservation and helping to safeguard Australia's biodiversity. Downstream beneficiaries include zoos, wildlife managers, the Australian crocodile, pet and tourism industries.					
FT200100525 O'Sullivan, A/Prof Sandy T	Saving Lives aims to map the unique contribution, influence and impact of Indigenous LGBTIQ+ creative artists, to understand how modelling complex diversities enhances well-being in Aboriginal and Torres Strait Islander Peoples and Communities. Using queer and critical race theories and a positively-charged mapping of complex identities found in art and art-making, the project expects to challenge simplistic ideas of what constitutes 'Indigenous Australia', their unique contribution, voices, and resistance. Expected outcomes will advance understandings of positive, diverse role modelling to the creative sector and national and international First Nations' communities, and provide significant benefits to well-being and identity-affirmation.	231,532.00	264,041.00	262,741.00	255,841.00	1,014,155.00
	National Interest Test Statement					
	For Indigenous peoples and communities, art is intrinsically connected to the maintenance and growth of our cultural connections and as a tool of well-being, affirmation and acceptance. Indigenous LGBTIQ+ people contribute uniquely to this diverse and complex creative expression, while conversely facing the highest rates of depression and suicide of any group in Australia. The Fellowship will focus on hearing and reflecting leading Indigenous voices from within the creative practice community, to form a platform in which the voices and visibility of queer First Nations' Peoples are amplified, and the impact of their contributions on our Communities is understood and amplified. A key national impact will be the development of tools to assist queer Indigenous people who may feel isolated in their own communities. These tools will support a greater understanding for our communities and in the broader population of the power of visibly diverse members presenting and promoting who they are, and in doing so it will challenge circumstances that can foster the feeling of isolation in LGBTIQ Indigenous People.					
	University of the Sunshine Coast	479,474.00	515,142.00	511,582.00	475,396.00	1,981,594.00
	Queensland	4,179,154.00	4,286,811.00	4,264,849.00	4,103,097.00	16,833,911.00

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South Australia						
The University of Adelaide						
FT200100062 Zheng, Dr Yao	The aim is to produce the fundamental science for sustainable production of fuels and chemicals through an advanced electrocatalytic approach using abundant small-molecule sources like water, carbon dioxide, and nitrogen oxides as feedstocks. A range of highly active and selective electrode catalysts will be developed for electrolysis processes at ambient temperatures and pressures, by an interdisciplinary approach combining atomic-level material design principles, in situ/ex situ instrumental techniques, and modern computation methods. The expected outcomes will be of great significance for renewable energy use and clean fuel generation – the major energy and environmental challenges facing Australia and the world. **National Interest Test Statement** The project will harness Australia's abundant solar and wind energy sources by storing them in fuels and chemicals in a novel electrocatalytic refinery system. The fuels and chemicals will be sustainable, safe, and easy to store and transport, and will have an important role in meeting Australia's obligations under the Paris Agreement. Future fuels and chemicals from such an electrocatalytic refinery process will be clean with low greenhouse gas emissions, and will provide great environmental benefits to Australia and the world. The project will also support increasingly public Australian aspirations to create new markets and supply chains as a renewable energy exporter, with expansion of Australian industries and employment, particularly in the rural and regional areas that are most exposed to the decline of extraction industries.	200,000.00	200,000.00	200,000.00	200,000.00	800,000.00
FT200100536 Neumann, Prof Frank	Bio-inspired algorithms have successfully been applied to a wide range of optimisation problems. Uncertainties in real-world applications can lead to critical failures of production schedules or safe critical systems. Chance constraints model such uncertainties and allow to limit the possibility of such failures. This future fellowship builds up the area of bio-inspired computing for problems with chance constraints. It develops high performing bio-inspired algorithms for stochastic problems where the constraints can only be violated with a small probability. The outcomes will lead to more effective and reliable optimisation methods for complex planning processes in areas of national priority such as mining and manufacturing. **National Interest Test Statement** Mining and manufacturing are key industries to the Australian economy. Cost effective production processes are required in order to obtain internationally competitive products. Production processes in the areas of mining and manufacturing involve uncertainties around the processing of components and materials used for production. Efficient production has to deal with such uncertainties in order to avoid extremely costly disruptive effects such as the halt of a production operation due to failures of machines. This project will develop new artificial intelligence-based optimisation approaches for these areas of national interest. The aim is to develop highly beneficial optimisation approaches for resource effective production while avoiding disruptive events in the production process. The outcomes will provide strong economic and safety benefits for the mining and manufacturing industries.	257,941.00	257,941.00	257,941.00	257,941.00	1,031,764.00
FT200100816 Demuro, Dr Martina	This project aims to develop unprecedented reconstructions of Neanderthal evolution, cultural and extinction histories at previously undatable or understudied European archaeology sites using a versatile luminescence dating toolkit. It will integrate multiple dating methods, palaeoclimate proxies and palaeoecological data to provide comprehensive knowledge of the timing, context and nature of Neanderthal evolution. Expected outcomes include unravelling past human responses to climate change, elucidating regional occupation patterns, emergence of complex behaviours, and causes of Neanderthal demise; with benefits for refining our own species deep-time evolutionary trajectory and global expansion across different regions, including Australia.	217,863.00	217,823.00	217,863.00	212,913.00	866,462.00

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	National Interest Test Statement Most Australians living today retain some Neanderthal DNA in their genomes. By uncovering the history of the Neanderthal lineage, this project will enhance understanding of our own deep-time, shared cultural ancestry, including better understanding of human settlement of Australia. The project will build critical mass of sought-after geoscience expertise and develop techniques that will generate commercial and export opportunities across many sectors including mining, archaeology and government, and improve science-based tourism initiatives at Australian heritage sites. The project addresses the Government's Science and Research Priority "Environmental Change" by improving knowledge of long-term interactions between human populations, ecosystems and climate. In turn this will refine current climate models and optimise modelling of future climate change. This project will generate intense international interest and promote Australian science and leadership by driving strategic networks with >25 international organisations at archaeological sites across 4 countries, including 2 UNESCO World Heritage sites.					
FT200100870 Mellin, Dr Camille	This Fellowship aims to address the vulnerability of coral reef fisheries in Australia and the Indo-Pacific by identifying fishery targets that benefit human nutrition and will persist despite declining coral habitats and rising water temperature. This project will advance knowledge on coral and fish responses to increasingly frequent marine heatwaves, using novel methodologies rooted in ecological modelling, experimental marine biology and climate forecasting. Expected outcomes include (i) a comprehensive toolbox for improved management of coral reefs and associated fisheries in Australia and beyond, and (ii) an integrated socio-ecological model for predicting coral reef fishery responses under environmental change.	207,373.00	203,163.00	167,548.00	161,473.00	739,557.00
	National Interest Test Statement Coral reefs fisheries support the livelihoods of millions of people worldwide, yet are increasingly threatened by climate-mediated disturbances such as coral bleaching. Shifts in species distributions, population declines, and changing nutritional content of many fish species will likely impact human health. This project will provide better management tools for future coral reefs and dependent societies by (i) developing new predictive models that integrate climate scenarios, coral reef composition and cover, and fish distribution and abundance, (ii) mapping the vulnerability of coral habitats to future thermal stress, and (iii) identifying fish species that provide more sustainable and nutritious fishery targets in a warming ocean. Project outputs will support the adaptive capacity of tropical reef fisheries in Australia and beyond, not only by better safeguarding the coral habitats that sustain fish biomass, but also by improving food policies by considering nutritional quality as well as the volume of food produced.					
	The University of Adelaide	883,177.00	878,927.00	843,352.00	832,327.00	3,437,783.00
University of South Australia						
FT200100154 Warren-Smith, Dr Stephen W	This project aims to establish the next frontier in photonic waveguide sensing, by using machine learning to shift the complexity out of conventional photonic-waveguide/optical-fibre sensors and into smart detection algorithms. The complexity and instability of multimode photonic waveguides, traditionally a hinderance to sensing, will be advantageously employed to train deep learning models for sensing. Expected outcomes include the creation of intelligent photonic sensors that can, in principle, measure any environmental parameter using any optical waveguide material. It will create new critically needed measurement capabilities for challenging harsh environments, such as extreme temperature and in-vivo biochemical sensing.	192,863.00	191,863.00	195,863.00	197,863.00	778,452.00
	National Interest Test Statement This project aims to develop intelligent photonic sensors that can, in principle, measure any environmental parameter using any optical waveguide material. Demonstrating this new technology through two critical application areas will result in direct benefits to both heavy industry and biomedicine. First, sensors for monitoring extreme temperature profiles will be developed, which are critically needed in energy intensive applications such as steel fabrication and gas turbines; to improve energy efficiency, product yield, and furnace operating lifespans. Second, the same platform technology will be applied to biochemical sensing, with the promise of robust sensors capable of minimally-invasive spatial profiling of pathogens and disease biomarkers in the body. This will advance life sciences research and ultimately provide early diagnostic tools to improve patient outcomes and quality of life. Outcomes of this fellowship will add to Australia's burgeoning photonics manufacturing industry through the creation of globally-competitive high-value sensing products.					

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FT200100301 Ramiasa-Macgregor, Dr Melanie N	This project aims to determine how minuscule particles behave on surfaces with different nano-architecture. Modern technologies already use nanodecorated materials to lubricate engines or capture tumour cells. Yet, their potential in applications for sustainable catalysis, gas treatment or water splitting cannot be realised until we understand how nano-objects adsorb to surfaces with features of comparable size. The expected outcomes include new methods, models and a workable map of protein adsorption allowing us to 1) create advanced substrates for targeted applications and 2) understand existing phenomenon governed by naturally occurring nanoroughness. It will benefit manufacturing in fields ranging from biology to energy production. **National Interest Test Statement** This project will fabricate new advanced materials in which the surface roughness can be controlled with nanoscale precision so that the wetting behaviour of these materials can be tested and modelled. The wetting behaviour of materials depends on the surface roughness and understanding this and how to control it will allow new materials to be applied in critical industries. In one example, materials with controlled surface roughness will be used to develop new biosensors to support Australian-based manufacture of new diagnostic testing platforms, such as for early stage cancer detection, viruses or other pathogens. In another example, this project will develop model systems that mimic the interaction between rocks and fracking fluids for nanofracking, a new, enhanced and sustainable oil recovery process. This process requires nanofluids to effectively wet and penetrate the surface of nanoporous rock deposits. This project will be used to enhance extraction for commercial fluids in the Australian Cooper Basin thorny shale deposits with direct financial benefits for Australian oil and gas operations.	200,863.00	199,363.00	198,863.00	194,000.00	793,089.00
	University of South Australia	393,726.00	391,226.00	394,726.00	391,863.00	1,571,541.00
	South Australia	1,276,903.00	1,270,153.00	1,238,078.00	1,224,190.00	5,009,324.00

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Tasmania						
University of Tasmania						
FT200100049 Bissember, Dr Alexander C	This project will explore and establish original strategies that use inputs of energy (light and electricity) to break or form chemical bonds, which can provide new or improved access to valuable compounds. In this way, this research will augment or enhance existing methods for the selective and direct manipulation of molecules by creating tools that allow chemists to prepare molecules under particularly mild conditions. The outcomes of the project will include the development of new technology for organic synthesis and forging novel approaches for chemical alkylation and cross-coupling reactions. This can contribute to making important compounds more efficiently, safely and cheaper to produce in the future. **National Interest Test Statement** This project will investigate and develop original approaches for facilitating chemical reactions to better enable the synthesis of important molecules. The international standing of Australian research in the chemical sciences will be reinforced and extended in a number of advanced areas, as the project delivers technology that is translatable for the enhanced and more efficient synthesis of pharmaceuticals and agrochemicals across academic and industrial settings. The project aligns with national priorities outlined in the Federal Government's Australia 2030: Prosperity through Innovation plan. Expected practical outcomes will include the social and economic benefits that arise from making valuable compounds more readily available, more sustainably, and cheaper to produce. The research project also offers unique opportunities to train the next generation of expert chemists to develop contemporary methods for chemical synthesis.	227,101.00	226,101.00	227,101.00	234,101.00	914,404.00
FT200100102 Allen, Dr Kathryn J	This project aims to analyse a 2000-year palaeoclimate record of single event and complex climate extremes to provide a long-term context for observed changes in climate extremes over recent decades. This project expects to generate new knowledge about long-term variability in the frequency and magnitude of climate extremes that occur on seasonal - decades time-scales. It also expects to provide information about complex extremes that involve multiple types of impacts (e.g. drought followed by flood, simultaneous drought and fire). Expected benefits of the project include improved understanding of climate extremes and improved risk estimates for the impacts of climate extremes on Australian government and industry infrastructure. **National Interest Test Statement** This project will develop a much longer record of single event and complex climate extremes than is available in the instrumental record. Complex climate extremes, also known as compound extremes, are comprised of two or more climate events and result in greater impacts on society and environment than single event climate extremes. Their frequency and intensity are projected to increase in the future, but because extreme events are rare, the instrumental record is not long enough to really understand how unusual current changes are. Nor is it long enough to obtain robust estimates of risk to infrastructure from. A 2000-year record will better capture very rare extreme impacts and improve risk estimates of their occurrence. This project directly addresses challenges relevant to environmental change by putting recent observed changes in a much longer context. The outcomes of the project will provide a stronger empirical foundation for policy and planning decisions around options for responding and adapting to the impacts of environmental change on biological systems, urban and rural communities, and industry.	197,863.00	195,863.00	196,863.00	203,000.00	793,589.00
FT200100846 Bach, Dr Lennart T	This project aims to be the first to assess risks and co-benefits of Enhanced Weathering for marine pelagic ecosystems. Enhanced Weathering is a powerful tool that can reduce atmospheric CO2 with significant economic co-benefits. However, it perturbs seawater chemistry and associated impacts on marine ecosystems are unknown. This project expects to combine state-of-the-art field and laboratory research to reveal whether Enhanced Weathering is a sustainable tool for CO2 Removal. The project provides significant benefits as it builds capacity within the currently emerging research field “ocean-based climate change solutions”. Within this capacity, it will help to identify a sustainable and economically viable future for Australia.	197,863.00	195,863.00	200,863.00	192,468.00	787,057.00

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	National Interest Test Statement Accelerating the chemical weathering of rocks (i.e. “Enhanced Weathering”) is one of the most promising approaches to remove CO2 from the atmosphere and counteract climate change. The application of Enhanced Weathering will have huge co-benefits for Australian key economies. Australia’s mining industry will benefit from extracting and processing suitable rock material. Australia’s farmers will benefit from distributing rock powder onto their soils, which massively increases soil fertility, pest resistance, and crop yields. While having economic benefits, Enhanced Weathering could also lead to significant disturbance of marine ecosystems by residual elements from the weathering reaction such as trace metals. This project will determine whether Enhanced Weathering could endanger some of Australia’s unique marine ecosystems (and associated economy), or if it represents a sustainable tool for climate mitigation. The outcomes will provide guidance for establishing/improving important Australian economies and support the management towards sustainable marine environments.					
FT200100949 Ling, Dr Scott D	The accelerating collapse of reef ecosystems represents one of the greatest threats for marine biodiversity and seafood production worldwide. To confront this emergency, this Fellowship will determine reef health tipping-points and provide a new 'reef ecosystem triage’ approach to prioritise the order of preventative treatments to safeguard threatened reefs, while directing remediation efforts to collapsed reefs where recovery is most probable. The research will directly benefit reef-dependent industries and coastal communities by providing an objective evidence-based reef health system to protect against collapse and to identify our greatest opportunities to recover vast biodiversity and economic potential for reef ecosystems.	236,016.00	244,981.00	243,341.00	191,581.00	915,919.00
	National Interest Test Statement Australian reef ecosystems are highly diverse and productive, but prone to collapse which causes significant losses to biodiversity, fisheries and tourism industries; all of which are fundamental to our identity as an island Nation. From the demise of giant kelp forests in Tasmania to widespread bleaching of corals on the Great Barrier Reef, loss of these living reef habitats is occurring across unprecedented scales. This Fellowship will address escalating reef emergencies by identifying critical tipping-points in reef health to guide a new ‘ecosystem triage’ strategy to direct effective preventative measures to safeguard reefs nearing collapse, while prioritising remediation of reefs where recovery is most probable. This new reef health system will benefit reef-dependent industries and the Australian coastal community by maximising protection of threatened reefs, while providing clear guidelines for unlocking collapsed reefs to enable restoration of biodiversity and economic productivity across our vast National reef estate.					
	University of Tasmania	858,843.00	862,808.00	868,168.00	821,150.00	3,410,969.00
	Tasmania	858,843.00	862,808.00	868,168.00	821,150.00	3,410,969.00

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(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
Victoria						
Deakin University						
FT200100730 Liu, Dr Dan	This project aims to develop a series of novel 2D nanomaterials and their nanocomposites that have applications ranging from energy storage via a functional separator for batteries to thermal management devices. Developing novel functional 2D nanomaterials is important for several applications including energy storage, composite materials, and thermal management, as well as advancing knowledge in the control design of 2D nanomaterials and to promote the development of sustainable energy storage and thermal management technologies. The benefits to Australia, will be in addressing energy and environmental concerns by developing new clean and environmentally friendly energy devices and boosting national economic growth. **National Interest Test Statement** This project will develop functional 2D nanomaterials and their novel composites and aerogels that will allow fabrication of highly efficient and effective devices with potential use in sustainable energy storage and thermal management applications. Expected outcomes include a clear understanding of the relevant fundamental science and mechanisms, a framework for designing and optimising for specific applications, and a demonstration of prototype devices. Success of the research can bring huge benefits to sustainable energy through development of advanced nanomaterials and devices. This research has great potential to impact millions of Australians – through the development of a cutting-edge sustainable energy storage and thermal energy management platform; the substantial benefits of the application of this platform to establish a sustainable energy future; and through the cultivation of next-generation materials scientists through high-quality training. Industries such as water purification and wearable electronics would also benefit from the outcomes of this project.	182,353.00	204,562.00	203,012.00	201,501.00	791,428.00
	Deakin University	182,353.00	204,562.00	203,012.00	201,501.00	791,428.00
La Trobe University						
FT200100099 Seear, A/Prof Kate	Globally, recognition is growing that common prohibitionist drug policies contribute to drug-related harms and have not succeeded. Identified harms include the current drug overdose crisis in North America and a surge in overdose deaths in Australia, adding new force to calls for urgent reform. This project aims to respond to these calls by exploring how human rights considerations can inform improvements to drug policy. The project seeks to generate new knowledge on how human rights can guide reform so as to improve social, economic and health outcomes. The project should provide significant benefits to the nation, informing Australian legal, policy and practice reforms as well as international efforts to reduce drug-related harms. **National Interest Test Statement** Legal, social and health issues relating to alcohol and other drug use cost at least $25 billion per year (e.g. overdose, drug-related illnesses, accidents). There is an urgent need to avert further social, economic and health costs. Discussion in the alcohol and other drug field is increasingly focused on the potential benefits of human-rights based drug law reform. Canada has reformed its approach based on human rights considerations, such as the rights to health and life. Using human rights mechanisms, new policies and services have been made available, including life-saving facilities and drug treatments. However, human rights approaches also have limitations for people who consume drugs. There is a need to explore whether and how human rights considerations might inform new and improved drug policy, law and practice. In addressing this issue, this project will position Australia as a world leader in the relatively new field of drug policy/law and human rights, and directly inform recommendations for reforming Australian drug law, policy and practice so as to improve social, economic and health outcomes.	260,781.00	256,570.00	259,317.00	257,352.00	1,034,020.00

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FT200100209 Cooklin, Dr Amanda R	This project aims to identify the priority job stressors that impact working families' wellbeing and child development, and to generate innovative job-based strategies to reduce work-family conflicts for working parents. Conflicts between work and family are common in Australia, reported by one in three parents. These affect productivity, family relationships and ultimately, child development. Evidence reveals that employers have struggled to implement family-friendly practices despite recent national policy initiatives. Using national cohort data and industry partnerships, this project investigates solutions to this urgent national dilemma to benefit those most affected by parents' job stressors – working parents and their children. **National Interest Test Statement** Australian research shows that one in three Australian parents report conflicts between their work and family demands. These conflicts are linked to lower productivity, poorer parent mental health, and may be an under-recognised factor in children's development. Policy and workplace solutions have not yet been widely effective. This Fellowship will provide urgent new evidence on work-care conflicts in the Australian policy and workplace context. It will also identify how parents' work-family stresses have flow on costs to children. Solutions, co-developed with industry, will be among the first nationally, harnessing momentum from business, industry and policy-makers. Through integrated problem-solving, the investigation will (i) maximise Australia's leadership in the work-family field; (ii) identify options for solving urgent problems faced by working parents and their families; and (iii) develop evidence-based strategies for Australian employees and employers, enhancing productivity and economic benefits to families and industry.	223,836.00	229,886.00	215,055.00	215,672.00	884,449.00
	La Trobe University	484,617.00	486,456.00	474,372.00	473,024.00	1,918,469.00
Monash University						
FT200100108 Chapple, A/Prof David G	The project aims to resolve the mechanisms that generate spatial variation in biological traits. This project expects to overcome several significant shortcomings of previous investigations by using mechanistic modelling, field-based ecophysiological studies, and macroecological analyses to develop a single, integrated approach to investigating geographic variation in size, colour, life history and reproduction. The expected outcomes are a comprehensive empirical test of a unified mechanism for spatial trait variation, using a diverse terrestrial vertebrate lineage as a model system. The results of this study should provide a powerful framework for predicting future patterns of biological trait variation under anthropogenic climate change. **National Interest Test Statement** Skinks are the most diverse terrestrial vertebrate family both in Australia. They exhibit substantial geographic variation in their size, colour, life history and reproduction. This project will use skinks as a model system to resolve the mechanisms that underlie the generation and maintenance of biological diversity, and how this diversity may be altered in response to anthropogenic climate change. Australia is a 'land of lizards', and skinks comprise the vast majority of this diversity, playing a critical role in many ecosystems, particularly in arid and semi-arid regions, where they are hyperdiverse. As such, they have considerable environmental, social and cultural relevance to Australia, and this project will improve our understanding of the processes driving the diversification of this iconic group, now and into the future. The project will also strengthen Australia's capability in critically important areas of ecology, evolutionary biology, and conservation biology.	253,807.00	253,632.00	245,532.00	244,582.00	997,553.00
FT200100218 Zhao, Dr Peishen	Current effort in developing drugs targeting G protein-coupled receptors (GPCRs) often result in low success rate due to the lack of understanding of the complexity and the spatiotemporal control of receptor function. The research program aims to understand the molecular mechanisms of receptor/transducer selectivity. The proposal integrated multi-disciplinary approaches to provide a deeper understanding of how the receptor is activated responding to different ligands. The anticipated outcome including an enhanced capacity for understanding the fundamental biology, a stronger national and international collaborations. This will provide significant benefits including expanded basic knowledge and improvements in drug development efficiency.	199,567.00	195,125.00	187,392.00	194,153.00	776,237.00

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	National Interest Test Statement This project focusses on an important group of cell-surface receptors (called G-coupled protein receptors) that are the biological target for over 30% of all approved medications. Despite their widespread use, modern drug discovery programs that target these receptors still suffer from high failure rates. This is due, in part, to a lack of detailed models for how these receptors are activated by cellular signals. This project aims to understand how an important sub-group of these receptors receive and handle cellular signals. Whilst the research is fundamental in nature, the flow on benefits of this project include valuable intellectual property about the factors that influence drug success which may ultimately underpin the development of more efficient drug discovery programs in Australia and internationally.					
FT200100221 Setoh, Dr Yin Xiang	This project aims to study a family of commensal viruses of mosquitoes called insect-specific flaviviruses that are naturally found in mosquitoes and do not infect or cause disease in vertebrate hosts. Using an innovative approach, this project employs cutting-edge molecular virology approaches to modify these insect-specific flaviviruses to enhance their ability to block the replication of other pathogenic viruses in the mosquito vector. Expected outcome of this project is a bio-control strategy that is complementary to the Wolbachia approach. The anticipated benefits include the advancement of knowledge of insect-specific flaviviruses, and promotion of interdisciplinary research across the fields of Entomology and Virology.	207,771.00	202,771.00	202,771.00	195,271.00	808,584.00
	National Interest Test Statement Mosquito-borne pathogens have a direct impact on Australia. Recently, an outbreak of encephalitis in horses in Southeastern Australia was cause by Kunjin virus which is transmitted by mosquitoes. These events have a negative environmental, social and economic impact, e.g. the risk it poses to the horse racing industry in the case of Kunjin virus. This project aims to advance innovation in methods for preventing mosquito-borne viruses, with a unique focus on studying and bio-engineering commensal viruses of the mosquito vector. The focus of this project is the better understanding of this technology, which may have future disease control benefits--that are out-of-scope from the current proposal. The advancement in knowledge will also benefit Australia's standing in the world, in terms of research into technologies that may have a major positive economic and social impact for many countries around the world inflicted by mosquito-borne viruses.					
FT200100259 Zhang, Dr Huacheng	This project aims to fabricate bioinspired light-driven ion transporters with biological-level active ion transport efficiency for efficient energy conversion and storage. Engineering of artificial membranes with ion-pump-like pore structures, specific ion binding sites and photo-excited molecular gates by an innovative bioinspired approach is expected to generate new knowledge in the field of biomimetic design of artificial ion-transporter membranes and bring new technologies to applications such as in solar energy harvesting, osmotic power generation, ionic batteries, and ionic circuits. The proposed research should provide significant benefits such as new energy conversion and storage technologies for Australian manufacturing industry.	209,672.00	200,672.00	201,672.00	173,363.00	785,379.00
	National Interest Test Statement Biological systems that efficiently use ion transporters for energy conversion and storage provide ample inspirations to revolutionise materials and devices for a wide range of applications. A novel bioinspired approach will be developed to fabricate advanced ion-transporter membranes for mimicking unique structures and functions of biological ion transporters at the molecular level. New and improved technological innovations in angstrom-porous material synthesis and modification will be delivered. This Future Fellowship proposal will provide novel bioinspired ion-transporter membranes with biological-level efficiency in energy conversion and storage that have not been achieved by conversional materials, which will ultimately benefit Australia’s advanced manufacturing sector and extend Australia’s leading position in the development of energy technology. This project has the potential to revolutionise energy industries by significantly improving the energy conversion efficiency and providing new photo-ionic energy technology, thereby underpinning a clean energy future for Australia.					
FT200100317 Simonov, Dr Alexandr N	This project aims to produce valuable chemicals from air, water and Australia’s abundant renewable energy, by developing efficient, robust catalysts for water oxidation, nitrogen reduction and ammonia oxidation — key processes for sustainable production of green fuels and fertilisers. The interdisciplinary project strategy will use a suite of advanced instrumental and theoretical tools to understand and control how catalysts operate. Expected outcomes include new techniques to study catalysts, new catalyst design concepts, and novel high-performance catalytic materials and devices for sustainable electrosynthesis. These new technologies should reduce emissions and help Australia be a world leader in renewable-energy and fertiliser export.	199,863.00	190,254.00	190,254.00	203,863.00	784,234.00

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	National Interest Test Statement The project will directly contribute to the Australia's national interest in the following contexts: (1) Economic: by introducing cheap and efficient electrocatalysts for the energy-efficient generation of renewable hydrogen and ammonia for export and internal use, and for the renewables-powered production of fertilisers, which can be also exported or used locally. (2) Commercial: by improving the efficiency of renewables-powered generation of hydrogen and ammonia for energy storage, as well as renewables-powered production of ammonia and nitrates to provide a conceptually new technology – on-demand production of fertilisers from air and water. Both technologies can be implemented on either a large, medium or small scale, and in remote areas. This could significantly reduce the expenses for farming and mining operations. (3) Environmental: via development of sustainable technologies that will replace the existing strongly-polluting hydrogen, ammonia and fertiliser production processes. This will facilitate the reduction of greenhouse gas emissions (CO2 and N2O) in Australia.					
FT200100519 Janovjak, Dr Harald L	This project aims to develop novel genetic methods and instrumentation for the local, rapid and reversible activation of genes in cells and mice. This project expects to generate highly innovative light- and sound-based technologies that will permit to study living systems on the gene-level with unprecedented precision. Expected outcomes include new research and technology capacity to broadly address fundamental biological questions and to create new applied processes. This project intends to provide significant benefits, such as enhanced knowledge generation, multidisciplinary training opportunities and patentable technologies.	202,951.00	202,951.00	201,251.00	201,251.00	808,404.00
	National Interest Test Statement This project will prototype and develop proof-of-principle technologies to rapidly turn genes on or off within cells. Prototypes will use wireless technologies, including light and ultrasound, to change the way genes function. In unlocking these genetic switches, the research will focus on ways to harness the discoveries into new devices and tools. The project is in the national interest because it will put Australia at the forefront of the invention of new genetic switches for use in valuable biotechnology industries. This technology could unlock new economic benefits in the biotechnology and materials science-based sectors. Specifically, the project will engage with companies and with the CSIRO to develop and commercialise new devices and approaches to drug development involving light- and sound techniques. The project will also enable new advanced manufacturing capability, and will contribute to major national programs including the National Research Infrastructure Synthetic Biology Roadmap and the CSIRO's Future Science Program.					
FT200100597 Protschky, Dr Susanne	This project aims to investigate the untold history of decolonisation in Southeast Asia through amateur soldier photographs taken on the front line of conflicts. Such photographs constitute a vast yet neglected archive that promises unique insights into encounters between combatants on all sides, and with civilians whose experiences have rarely been accessible, particularly women, children and unfree workers. The expected outcomes of this project are to produce new understandings of violence in decolonisation and the long-term legacies of colonialism in Southeast Asia. This project also intends to provide a critical historical framework for understanding the meaning and impact of photographs taken in war.	248,593.00	241,078.00	236,262.00	233,943.00	959,876.00
	National Interest Test Statement This project will generate benefit through a new understanding of conflict and decolonisation in Southeast Asia. Australian forces played a crucial role both as trainers and combatants in colonial conflict in the region and this project will draw on the large holdings of the Australian War Memorial, together with records in Indonesia, Malaysia, the Netherlands and the United Kingdom to open debate about truth, justice, rights and trauma in this historical context. Opening up access to archival, amateur photography from colonial conflicts will also enliven the experience of the history in our region. It will connect Australia's past with that of our neighbours, as well as with former colonial powers. The project will integrate Australian collections with international archival holdings to support social connections and enrich our multicultural society. In the context of Australia's strategic partnerships, including the recently-concluded Indonesia-Australia Comprehensive Economic Partnership Agreement, the project will also generate benefit through historically-informed engagement with our region.					
FT200100619 Parish, A/Prof Meera	The revolution in electronics and the Information Age were enabled by powerful theories based on the concept of the quasiparticle, an object composed of many particles such as electrons. This Fellowship aims to unravel the behaviour of new complex materials by investigating the nature of quasiparticles beyond the current paradigm. The key innovation is the use of trapped atoms, which allows new quantum theories and computational tools to be developed and precisely tested. The new knowledge generated by the Fellowship will advance a range of fields, including condensed matter physics, and could ultimately underpin a new generation of quantum devices featuring robust data memories, where information can be efficiently stored and extracted.	253,332.00	249,332.00	259,332.00	239,332.00	1,001,328.00

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	National Interest Test Statement The proposed research will generate new theories and computational tools that have the potential to revolutionise emerging quantum technologies such as quantum switches and sensors. This will further secure Australia's place at the forefront of quantum science and strengthen the links between Australian and overseas institutions via an extensive network of collaborators. Moreover, it will expand knowledge in the physical sciences by combining expertise in condensed matter physics and atomic physics to investigate questions at the forefront of current research, as well as capitalising on research experience derived from working at world-leading institutions overseas. In particular, the research project involves the training of students and junior researchers in cutting edge techniques for quantum systems, thus driving materials innovation and delivering the skills needed for the development of the next generation of quantum-based devices in Australia.					
FT200100703 Kellermann, Dr Vanessa K	The project aims to understand how species will adapt to climate change by examining a largely overlooked process: how competition shapes evolutionary responses. Rising temperatures will fundamentally alter where species live, re-shuffling communities. Yet, how changes in community composition will affect the way current assessments of species vulnerability to climate change is generally unknown. Expected outcomes include improved species models for predicting responses to climate change through the integration of competitive effects with environmental data. The benefit will be an increased accuracy in predictions of species at risk to climate change which will guide policy and management decisions to protect vulnerable environments better.	205,347.00	214,889.00	215,865.00	210,650.00	846,751.00
	National Interest Test Statement Insects represent one of the most biodiverse groups on the planet and play a critical role in ecosystem health and function. To limit the impact of climate change on this important group of species requires developing better predictions of species vulnerability under climate change. But there is a gap in our understanding; we do not know how competition with other species will change species vulnerability to climate change. This research will develop distributional models and risk maps that explicitly consider the role of competition. The outcome will be better assessments of how climate change will impact species vulnerability and extinction risk. Through identifying species most vulnerable to climate change, this project will deliver vital information about community-wide impacts of climate change to landowners, policy-makers, and stakeholders. The intended outcome will be the better management of vulnerable species, pests and diseases and will train researchers in an area of national research priority.					
FT200100761 Kulic, Prof Dana K	This project aims to develop robots that can interact with and learn from humans to quickly and safely learn new skills. Recent advances in robotics and artificial intelligence are poised to transform our economy, workplaces and homes, and even the organisation of society, however these advances are limited by robots' inability to learn and adapt in uncertain environments. The outcomes of this project are expected to include new validated methods and frameworks to enable robots to be used by non-experts and to be quickly deployed in a variety of settings. This is anticipated to provide transformative benefits, improving safety and productivity in the workspace, and enabling improved comfort, convenience and quality of life in the home.	268,551.00	264,847.00	262,521.00	256,630.00	1,052,549.00
	National Interest Test Statement This project will strengthen Australia's expertise in robotics and machine learning, and provide the needed robot capabilities to enable robot deployment in natural and dynamic environments. It is estimated that robotics can deliver AU$1 trillion in productivity gains through increased automation, while increasing employment by 6% and decreasing workplace injuries by 11%. This project directly addresses this vital need, by developing robotic systems that can be deployed quickly and easily by untrained users. Robots that are easy to teach and can learn quickly and safely from novice users can deliver productivity and safety improvements in a broad range of applications, including manufacturing, service, agriculture, mining and home assistance.					
FT200100813 Watkin, Dr Christopher M	This project aims to develop a new approach to understanding the purpose and power of social contracts: implicit agreements among members of a society to cooperate for mutual benefit. Australia's post-war prosperity has relied on a robust social contract, but it is under increasing strain today from new technological, environmental and socio-political realities. Using techniques from philosophy and social theory, this project seeks to examine the main pressures on the social contract today, and to propose how it can be reinforced. Intended benefits include strengthening social cohesion through better understanding the causes of reduced wellbeing, social fragmentation and unrest, and through proposing ways to mitigate their costly effects.	202,324.00	200,391.00	202,324.00	200,391.00	805,430.00

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	National Interest Test Statement A strong social contract is the basis of a cohesive, civil and prosperous society. Social contract language is at the heart of a number of important contemporary debates such as the regulation of big data and artificial intelligence, measures to combat violent extremism, and how we best use and protect Australia's precious natural resources. There is also a documented pattern of movements such as Occupy and Extinction Rebellion evoking a broken social contract as legitimation for causing unrest in Australian cities. The perception that the social contract has been broken, along with the tensions and resentment to which this conviction can give rise, pose a threat to the civility, cohesion, and eventually the stability of Australian society. This project aims to increase Australia's resilience to tensions within its social fabric through contributing to the understanding of how and why social contracts break, and through showing how they can be strengthened. Given the large social and economic costs of reduced social cohesion, this could be of enormous national benefit in the years to come.					
FT200100822 Wilson, Dr Laura A	This project aims to address the unresolved evolutionary origins of bat echolocation. Using a unique combination of development, evolution and novel engineering testing, this project expects to generate new insights into how features of the skull have evolved to allow bats to use their senses to interact with the environment. Expected outcomes include the identification of skull features that are unique to echolocating bats and tests of how these relate to the frequency and detection range of sounds produced. Benefits include improved conservation planning for urban and rural bat populations, and potential commercial advances through engineering applications that mimic the biological process of echolocation.	217,783.00	217,133.00	199,544.00	170,523.00	804,983.00
	National Interest Test Statement This project will provide a much-needed developmental and functional perspective on the origins of bat echolocation and the tools necessary to apply this knowledge to interpret how bats have evolved to interact with their environment. The novel methods developed here will generate new insights into the most extreme sensory adaptations seen in mammals and will identify morphological features that reflect adaptation to habitat structure. Bats are important contributors to ecosystem health (e.g. pollination) and human health (e.g. carriers of viruses), comprising 25% of Australia's mammal fauna. The results will improve the accuracy of conservation and management assessments for urban-dwelling and wild bat populations by removing the need to rely on traditional field survey data, which are known for only a handful of species. The novel insights into how bats modify sound have potential to yield benefits via commercial advances in engineering applications that mimic the biological process of echolocation: the astounding sensory capabilities of bats are not yet matched by engineering systems.					
FT200100880 Scott, A/Prof Timothy F	This project aims to advance the development of high-throughput stereolithographic additive manufacturing of thermoplastic polymers and composites by employing a multi-colour irradiation schemes in conjunction with photopolymerisable, ring-opening monomer resin formulations. The fundamental scientific understanding, engineering expertise, and concomitant technology advances generated by this project are anticipated to enable additive manufacturing to transition from the rapid prototyping of individual, unique items to the high volume production of robust, reprocessable plastic parts. By obviating the large capital expense of conventional fabrication, this developed technology should provide a path to reinvigorate Australian manufacturing.	260,000.00	270,000.00	270,000.00	265,000.00	1,065,000.00
	National Interest Test Statement Significantly greater penetration of additive manufacturing (AM) in medical, dental, automotive, and aerospace markets by improving material properties and increasing fabrication rates to afford a value proposition for potential customers requires a fundamental transformation in AM processes. The research described here will allow for the fabrication of polymer and composite objects with mechanical, thermal, and chemical properties far exceeding those of parts made by contemporary AM approaches, and provide extensive training and entrepreneurial opportunities for scientists and engineers in a rapidly expanding and locally-relevant industry. Importantly, the model of distributed manufacturing facilitated by this AM research, where bespoke product designs can be distributed digitally for local fabrication rather than the physical distribution of mass produced items from a global manufacturing site, provides substantial environmental and economic public benefits by reducing transportation emissions and boosting Australian manufacturing and economic growth through training, jobs, and apprenticeships.					
FT200100884 Bui, Dr Ha	This project expects to transform the understanding of granular materials and their behaviour by establishing explicit links between the macroscopic responses of the materials and their evolving microstructural properties. This should lead to revolutionary constitutive models for granular materials that possess true mechanisms of evolving grain-scale structures. The proliferation of these new models should allow development of reliable predictive computational tools for the modelling and assessment of field-scale failure involving granular materials, enhancing the capability to assess the integrity and stability of earth structures, and benefitting the Australian economy, environment and public safety.	220,000.00	220,000.00	220,000.00	220,000.00	880,000.00

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	National Interest Test Statement Failures associated with granular materials are often destructive and can occur in many different forms (e.g. submarine landslides induced tsunami, mine tailings collapse, dam/embankment failure, foundation collapse), all of which are major threats that can destroy infrastructure and can be fatal to human life. The project expects to transform the current understanding of granular materials and how they fail across the scales, which are the key factors towards better prediction of earth-structure failures for risk assessment and mitigation. It should lead to the development of a novel computational tool capable of predicting not only the onset and failure of earth structures, but also the outburst flow of stored materials and their mixtures (e.g. water, debris flows, mine tailings). The intended outcome of the project is to dramatically improve strategies for risk assessment and mitigation to secure Australian infrastructures (i.e. earth structures, water retaining structures, mine tailings dams) under global environmental changes.					
FT200100918 Blair, Dr Victoria L	The design and realisation of new and important molecules requires innovative and efficient methods. This project will create a new store of active-metal molecular tools for the selective, catalytic and atom efficient construction of a diverse library of phosphorus heterocyclic scaffolds and chemical feedstocks relevant to biological, medicinal, and materials chemistry, and the fine chemical industry. Parallel studies employing environmentally friendly and benign deep eutectic solvents will allow for replacement of traditional hazardous volatile organic solvents, putting the newly created active-metal reagents at the forefront of the necessary shift towards a more sustainable and 'green' polar organometallic chemistry.	193,363.00	198,863.00	189,863.00	197,863.00	779,952.00
	National Interest Test Statement This proposed world class research plan has been designed to create novel active-metal molecular tools for the selective, atom-efficient and catalytic formation of heterocyclic phosphorus scaffolds and critical bedrock chemical feedstocks relevant to the modern medicinal, materials and chemical industries. Replacing traditional toxic and hazardous volatile organic compounds with environmentally friendly benign eutectic solvents (DES) in newly crafted active-metal reaction protocols will establish a more sustainable synthetic chemistry and has the potential to underpin new 'green' and sustainable manufacturing methods for the chemical and polymers industry. Overall this project seeks to put Australia at the forefront of sustainable organometallic chemistry while the training of young researchers will create a highly skilled Australian workforce for pharmaceutical, material and chemical industries.					
FT200100942 Gollo, Dr Leonardo L	This project aims to integrate advanced computational modelling and state-of-the-art recording techniques to generate new knowledge on the neural basis of ageing. People are said to grow wiser as they grow older, though more likely they will experience cognitive slowing and reduced memory functions that interfere with their daily lives. The anticipated goal of the project is to develop techniques to predict the personalised effects of brain stimulation on the ageing brain. The outcomes of this research could significantly improve understanding of brain ageing, and advance the fields of systems neuroscience, network science, and brain stimulation.	203,016.00	205,616.00	172,688.00	168,863.00	750,183.00
	National Interest Test Statement Ageing is often accompanied by increasing forgetfulness, distractibility, inflexibility, and decreasing memory and ability to think quickly. This project focuses on better understanding the effects of ageing on the brain and establishing the groundwork for developing personalised, non-invasive, brain stimulation techniques to potentially alleviate these undesirable cognitive effects of ageing. With complete understanding of the effects of brain stimulation, we can drive towards major advances in the selective manipulation of brain dynamics in the future. This technique has the potential to assist our increasingly elderly population, to make them more resilient to neurodegeneration, and remain active and independent members of society for longer.					
	Monash University	3,545,940.00	3,527,554.00	3,457,271.00	3,375,678.00	13,906,443.00

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(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
RMIT University						
FT200100073 Tetienne, Dr Jean-Philippe R	This project aims to create a universal, high-throughput platform to characterise magnetic 2D materials, by exploiting recently developed quantum diamond microscopy. It will enable the measurement of hitherto inaccessible magnetic properties of individual 2D microsheets, the imaging of device-relevant phenomena such as domain wall dynamics and skyrmionics, and the systematic screening of newly synthesised materials. Anticipated outcomes include crucial new insights into 2D magnetism and the discovery of magnetic 2D materials compatible with real-world conditions. This should accelerate the development of future energy-efficient and flexible electronics and memory technologies, where magnetic 2D materials are expected to play a key role.	200,863.00	190,063.00	191,163.00	187,863.00	769,952.00
	National Interest Test Statement Capitalising on Australia's long-term investment in quantum technologies, this proposal seeks to deliver new instruments and methods to characterise magnetic 2D materials. The new instruments and methods should have a commercial value in the form of new characterisation tools for the magnetic materials industry, for instance the magnetic hard drive industry (which feeds the ever-growing data centre industry) currently lacks non-invasive high-throughput tools for in-line monitoring. By using these new tools, the project will deliver new knowledge on magnetic 2D materials, and new materials that are compatible with real-world conditions (ambient air, room temperature operation). These new knowledge and materials may be the basis of new device concepts for data storage, especially in flexible/wearable electronics, and for energy-efficient information processing, which could have significant commercial benefits for Australia's burgeoning 2D materials and consumer electronics industries.					
FT200100100 Yu, A/Prof Haiqing	This project examines the development of the social credit system in China from a cultural and social perspective. It aims to empirically investigate the lived experience of social credit among individuals, families, and communities, in the context of China’s larger ambition to build a ‘digital civilisation’ through technological advancement. Expected outcomes include policy briefings, reports, and an open-access research hub, as well as agenda-setting academic publications. The project will advance public understanding of and inform policy responses to automated decision-making and society in both Western and non-Western societies.	270,000.00	255,000.00	255,000.00	245,000.00	1,025,000.00
	National Interest Test Statement As the first in-depth empirical study on the social implications of the social credit system in China, this project will provide significant economic, social and cultural benefits to the Australian community. It will inform the Australian public of social and cultural structures and values of non-Western communities and societies as they are transformed and impacted by automation technologies. It will result in a better understanding of the sociocultural factors informing individual, organisational, and national attitudes towards digital technologies and cyber security. The project will enhance Australian national research capacity and help secure Australia’s place at the forefront of global research on automated decision-making and Chinese society. Outputs from this project, in the format of policy briefings and opinion pieces, as well as academic outputs, will be of high value to policy analysis and development across industry, think tanks, government and community groups seeking constructive engagement with digital China.					
FT200100604 Henry, A/Prof Nicola M	This project aims to investigate the efficacy of digital tools and interventions to detect, prevent and respond to image-based abuse (the non-consensual creation or distribution of intimate images). Through a digital ethnography, victim and stakeholder interviews, online surveys, and an AI chatbot, the project expects to generate evidence and theory on both image-based abuse and internet governance. The expected outcomes include: increased understanding of the responsibility of digital platforms and the drivers of image-based abuse; improved platform and service responses; enhanced industry and scholarly collaborations; and harm reduction. Expected benefits include improved laws, polices and practices to tackle image-based abuse.	257,203.00	283,898.00	267,090.00	273,501.00	1,081,692.00
	National Interest Test Statement This research will inform policies and practices for detecting, preventing and responding to image-based abuse, as well as other forms of online violence, abuse and harassment. It will contribute to criminal justice policy, education and legislative reform for the prevention of crime. It will provide practical recommendations for digital platforms and services in their responses to image-based abuse in Australia and elsewhere that will directly benefit victims and inform organisational and governmental responses to this emerging social and legal problem. The project will also critically engage in debates about the future of artificial intelligence, the limits of sovereign laws, the unprecedented power of technology companies, and the role of these platforms and services for regulating harmful content online.					

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	RMIT University	728,066.00	728,961.00	713,253.00	706,364.00	2,876,644.00
Swinburne University of Technology						
FT200100985 Li, Dr Yali	With the advances in biopolymer and green chemistry, Ca-activated zeolite-based binder materials have become possible for eco-friendly infrastructure with high performance, low carbon footprint and low energy consumption. In this project, next generation binder materials will be designed and fabricated to cater for stringent environmental requirements for civil infrastructure. In collaboration with world leading experts, the newly developed binder will be tested in various engineering scenarios to understand nanoscience-based working mechanisms. It is expected that the novel binder will potentially reduce the use of conventional cement/concrete materials, contribute to a circular economy and help to mitigate climate change.	203,211.00	172,957.00	187,832.00	174,000.00	738,000.00
	National Interest Test Statement The key objective of the project is to develop a sustainable binder system for civil infrastructure via integration of biomineralisation processes with polymer waste, to contribute to a national circular economy and to tackle global climate change. The research outcomes will advance knowledge in: 1) crystal growth strategy using zeolite mineral as the source of calcium and nucleation sites; 2) multifunctional blending of biopolymer and biofibres; 3) crystal growth and distribution in the proposed heterostructure and the subsequent change in the structure; and 4) the effect of novel functional materials in field use. The project will potentially create new revenue streams for construction materials and train a workforce with cutting-edge knowledge and engineering skills. The newly developed binder materials will lead to future construction applications in the harsh Australian conditions that call for stringent requirements for infrastructure applications and other industry sectors.					
	Swinburne University of Technology	203,211.00	172,957.00	187,832.00	174,000.00	738,000.00
The University of Melbourne						
FT200100024 Thai, Dr Huu-Tai	Modular construction can tackle Australia's housing affordability crisis on a large scale. This project aims to develop cutting-edge technologies for the next generation of modular buildings by embracing recent breakthroughs in construction materials, computational modelling methods and construction techniques. Expected outcomes include a novel composite modular unit, a smart joining technique, a robust computational framework and design guidelines that enable modular buildings to be built taller, safer, faster and thus cheaper than current practices allow. This project will position Australia at the forefront of modular construction technology, and make the local construction industry more competitive globally.	211,101.00	211,101.00	211,101.00	191,101.00	824,404.00
	National Interest Test Statement Over the next 20 years, Australia will need to build more than one million social and affordable houses, costing the government $8.6 billion a year, to meet national housing requirements. Modular construction is a promising long-term solution that can tackle Australia's housing shortages on a large scale. This project will develop state-of-the-art technologies for the next generation of modular construction, and thus provide significant economic and social benefits to the Australian community. This project will also benefit the environment since modular construction can reduce construction waste onsite up to 90% compared to traditional onsite construction. In addition, project outcomes including the invention of a smart joining technique for inter-module connections also have significant commercial potential. The modular construction technologies developed in this project will be world-leading and ensure Australian construction practices are at the forefront of international trends, and thus securing Australia as a global leader in modular construction technologies.					
FT200100025 van Heerwaarden, Dr Belinda	This project aims to establish whether endosymbionts alter climate change vulnerability and investigate the potential for endosymbionts to be used as a tool to modify climate change resilience in insects. Heritable endosymbionts – microscopic bacteria living exclusively within host cells – are widespread in insects. A handful of studies indicate that endosymbionts may influence the thermal tolerance of their host, yet whether they alter the upper thermal limits and climate change risk of insects is unknown. This fellowship will provide a greater understanding of the consequences of climate change on species persistence, as well as opening up avenues to utilise endosymbionts as a tool to manipulate the climate change resilience of insects.	200,237.00	215,204.00	196,377.00	215,809.00	827,627.00

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	National Interest Test Statement Understanding the factors that underpin the vulnerability and resilience of insects to climate change is crucial for successfully managing this ecologically and economically important taxonomic group. This project will determine whether heritable bacterial endosymbionts - which are widespread in insects – alter climate change vulnerability and whether endosymbionts can be used as tools to modify climate change resilience. The outcomes of this research will benefit Australia by improving our ability to identify species and populations at risk from global environmental change, as well as increasing our capacity to predict the climate change resilience of invasive species, disease vectors, and agricultural pests. This research will contribute cutting-edge knowledge and training in an area of national research priority, and could deliver vital information about climate change vulnerability and novel climate mitigation strategies to researchers, managers, policy-makers, and other stakeholders.					
FT200100098 Ackland, Dr David C	Human movement disorders affect one-third of Australians; however, conventional approaches to assessing joint motion are costly and largely clinic- or laboratory-based. This project aims to combine biomechanical modelling and advanced machine learning to non-invasively produce accurate, low-cost, user-friendly shoulder and elbow joint angle measurements using wearable inertial sensors. The technology will enable a non-expert to obtain reliable kinematics data in any location. Accurate, wearable motion measurement will benefit next-generation healthcare including telemedicine and remote rehabilitation for isolated communities, performance monitoring of elite athletes and military personnel, and the gaming and film/animation industries.	223,110.00	234,326.00	232,233.00	230,390.00	920,059.00
	National Interest Test Statement The Fellowship aims to combine advanced biomechanical modelling with new machine learning algorithms to generate accurate, user-friendly human motion measurement using low-cost, wearable inertial sensors. It will bring together world leaders in biomechanics, data science, software engineering, orthopaedic surgery, and Australian Indigenous leaders. The technology developed will transform human-device interactions via the Internet of Things, enabling cloud-based acquisition and analysis of movement data in real-time or over extended periods (days, months or years) remotely. A subject could acquire their own joint motion in the home with little training, facilitating low-cost telemedicine and rehabilitation for remote communities. This would impact the multi-billion-dollar wearables market and Australian Medtech, with future applications in sports and elite athlete training and injury prevention, and human performance monitoring of military personnel. Cultural benefits include the digital recording and curation of Indigenous Australian customs such as hunting using a spear and womera, tool making and dancing.					
FT200100246 Hogendoorn, Dr Hinze	This proposal aims to understand how the brain compensates for its own internal delays to function in real-time. Because it takes time for information from the senses to reach the brain, it takes time for us to become aware of an event that occurs in the outside world. This project will use an innovative combination of techniques to study how prediction and reconstruction mechanisms work together in the brain. Expected outcomes of this project include a fundamental understanding of how we function in the present. This should provide significant benefits, such as an important theoretical advance in our understanding of how conscious awareness is realised in the brain, placing Australia at the cutting edge.	235,524.00	238,578.00	233,260.00	212,913.00	920,275.00
	National Interest Test Statement This project aims to answer a question that is critical not only to understand how our brain allows us to function in our dynamic world, but also to understand the very nature of our conscious experience. As innovative and internationally competitive research, this fellowship will build multidisciplinary collaborations with leading experts and institutions both nationally and internationally, strengthen Australia's research capacity, and cement its position as a world-leader in fundamental cognitive neuroscience research. In addition, it will inform the development of the next generation of bionic and biology-inspired cloud-based electronic devices. Understanding how the brain compensates for its delays will enable us to implement similar mechanisms in these integrated devices to address the system and network delay incurred by communication. Being at the forefront of research in this field will give an important commercial and economic advantage to Australian electronic engineering.					
FT200100270 Scott, Dr Nichollas E	Protein glycosylation, the chemical addition of sugars to proteins, is an important but poorly understood aspect of bacterial physiology. This project aims to build on our recent discovery of the conservation of O-linked glycosylation across the Burkholderia genus to understand the function of this modification. Using cutting-edge proteomics, novel expression systems and molecular approaches this project will reveal the role of glycosylation in Burkholderia species. This innovative project will provide a comprehensive understanding of how glycosylation contributes to Burkholderia protein function and how these systems can be harnessed for the creation of bespoke glycoconjugates	216,844.00	217,541.00	216,074.00	200,311.00	850,770.00

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	National Interest Test Statement This proposal seeks to reveal how glycosylation shapes protein function in the Burkholderia genus. This group of bacteria interacts with the Australian population in multiple ways, for instance, within Northern Australia Burkholderia pseudomallei is the most common cause of community-acquired bacteremic pneumonia with a 40% mortality rate. By understanding the impact of glycosylation on Burkholderia proteins this has the potential to provide new insights into how bacterial glycosylation can be harnessed to both protect people from Burkholderia infections and to produce commercially important proteins, such as glycoconjugate vaccines. Undertaking this research will strengthen Australia's research capacity in the production of glycoproteins and enable the training of the next generation of researchers in these skills. These skills are essential for probing how glycosylation effects biological processes, an increasingly active area of research. Combined this will lead to better visibility for Australian science and further our standing as world leaders in glycobiology.					
FT200100401 Hinde, Dr Elizabeth H	This project aims to track DNA repair factor recruitment in the nuclear landscape of a living cell and quantify the role of nucleus architecture in maintenance of genome integrity. By coupling advanced fluorescence microscopy with a novel DNA double strand break inducible cell system, this project expects to uncover how the nucleus spatially coordinates DNA damage detection, assessment and repair in real time. This research is important because DNA damage threatens organism survival and this project has the potential to define how this genomic threat is resolved at the single molecule level. The benefit of this research is a fundamental insight into DNA repair biology and development of imaging technology to quantify genome function.	223,000.00	219,000.00	222,000.00	212,000.00	876,000.00
	National Interest Test Statement DNA is the genetic code for life, however, breaks in its strands damage genomic integrity, leading to cell dysfunction. This DNA damage is detected and repaired by DNA factors that navigate the nuclear landscape to find and repair DNA double strand breaks through unknown mechanisms. These processes underpin the sustainability and propagation of life forms and represent basic aspects of cell biology with broad relevance to human, animal, plant and microbial life. This Fellowship will develop imaging methods to understand these processes in a living cell. The findings will advance fundamental understanding of how the DNA blueprint of cells is protected and faithfully transmitted when cells divide. Significant national benefits include new imaging technology that will enable cell biologists to quantity these and other genome functions, strengthening of Australia's research reputation and international collaborations in cellular biophysics and imaging, and developing the next generation of Australian biophysicists.					
FT200100431 Ridout, Dr David	Conformal field theory provides powerful methods for attacking problems in theoretical physics and furnishes beautiful connections between seemingly disparate branches of pure mathematics. This proposal aims to greatly expand our knowledge of the logarithmic conformal field theories that have recently witnessed a resurgence of interest in physics. Advancing these theories is crucial to progress in high-energy physics and pure mathematics. Expected outcomes include a completely new understanding of the mathematical structure of these theories which will, in turn, facilitate applications in 4D gauge theory. This will boost research capacity and further cement Australia's reputation as an international leader in mathematical physics research.	230,101.00	227,101.00	229,101.00	222,806.00	909,109.00
	National Interest Test Statement The standard model of particle physics is a theoretical framework for understanding the fundamental forces that operate in the universe and the nature of the elementary particles that make up matter. The model has been extremely successful but lacks an explanation for gravitation, dark matter and imbalance of matter and anti-matter in the Universe. Recently, physicists discovered an exciting new relationship between important supersymmetry theories and the correspondence between certain so-called 2D theories and 4D theories capable of describing the universe. The research will result in new mathematical tools that will significantly benefit research groups across the fundamental and enabling sciences. The research will also provide a fertile education platform and problem-solving skills for a future generation of Australian scientists in academia, defence, finance and industry.					
FT200100457 Tian, A/Prof Yinghui	This project aims to advance the fundamental scientific understanding of embedded anchor behaviour and to develop engineering solutions to secure the next generation of floating platforms, wind turbines and submerged tunnels. This is significant because limited understanding of anchors under long-term sustained and cyclic loading, and in how wave-chain-anchor systems behave, is hindering confident deployment in deep water and harsh conditions. This project will address this challenge by combining precise observations from sophisticated physical and numerical experiments into an analysis framework that integrates system response. Outcomes will include numerical software, analytical tools and design charts for engineers to use in design.	260,000.00	260,000.00	260,000.00	260,000.00	1,040,000.00

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	National Interest Test Statement This project will deliver scientific knowledge and engineering solutions to secure the next generation of offshore floating infrastructure to the seabed. This will have direct impact and benefit to Australia's national interest, because deploying floating liquefied natural gas (FLNG), wind turbines and tunnels will help meet our increasing need for energy and mobility. (i) Australia's export of natural gas contributes $21.8 billion to the national economy. This will be enhanced with anchoring solutions that push FLNG into deeper waters, where the majority of our 'stranded' gas reserves lie. (ii) Floating wind turbines are a game-changer to tap Australia's rich ocean renewable energy, but require cheaper and more reliable anchors. (iii) Developing anchoring solution to the promising submerged floating tunnel concept will provide Australia with a first mover advantage in any future wave of investment in long distance coastal transport. The completion of this project is expected to strengthen Australia's leadership and guarantee our future competitiveness in the field of offshore engineering.					
FT200100630 Zhang, Prof Yuting	Rising health costs is a global challenge. Creating an efficient health insurance system is a key policy concern in all developed countries. This project aims to study choices, consumer behaviors, and policy challenges in two health insurance markets: Australian private health insurance (PHI) and US Medicare prescription drug insurance. Expected outcomes include new evidence needed to develop a new framework for PHI, new knowledge on how consumers respond to complex pricing structures, and new policy proposals to improve the overall efficiency of the health system. The research will benefit the re-design of PHI and the health system to improve Australians' health while saving health costs.	224,332.00	224,332.00	224,332.00	224,332.00	897,328.00
	National Interest Test Statement This project will deliver the knowledge needed to transform Australian private health insurance and improve the Australian health system. Australians spend $181 billion in healthcare per year, accounting for 10% of overall economic activity. The Australian government pays $6 billion per year in rebates to subsidize private health insurance; this is controversial because all Australians already have Medicare coverage. This project will provide new evidence on whether the large subsidies can be justified and propose new policies in reforming private health insurance. It will also advance our knowledge on how consumers respond to complex pricing structures and on how to design a value-based healthcare model. This will improve efficiency and sustainability of the Australian health system. A more efficient health system will improve Australians' health while reducing overall healthcare costs.					
FT200100732 Traub, Prof Rebecca J	Traditional diagnostic tests limited by their accuracy and ability to detect more than a few pathogens at one time, presents a major hurdle to protecting Australia's companion animals from a plethora of exotic and emerging vector-borne diseases (VBD). Many of these diseases also pose a major risk to public health. This project aims to develop, validate and verify a highly accurate, cost-effective, portable metabarcoding diagnostic test capable of detecting known, emerging and novel parasitic, bacterial and viral VBD pathogens simultaneously, from clinical samples. The assay will represent a potential paradigm shift in the way VBD are tested, for the purpose of safeguarding Australia against VBD bio-incursions.	270,332.00	272,332.00	272,332.00	272,332.00	1,087,328.00
	National Interest Test Statement Safeguarding Australia from incursions and establishment of exotic vector-borne diseases (VBD) that impact on the health of companion animals, the public and potentially of native wildlife, necessitates a stronger, more technologically advanced bio-security system to mitigate their adverse economic, cultural, and social impacts on our nation. Emerging diagnostic technologies for exotic disease surveillance with the potential to improve feasibility, efficiency and cost-effectiveness of bio-security activities, were identified by national stakeholders as an area of priority for responding to current and future bio-security threats. This proposal directly responds to this call-to-action, by developing a novel portable, metagenomic-based diagnostic that enables exotic and emerging VBD pathogens of companion animals, some of which are transmissible to humans, to be 'screened and discovered' simultaneously, in a rapid and cost-effective manner. Validation of this novel diagnostic test will represent a paradigm shift in testing for these VBDs at all levels of our nation's bio-security implementation program.					
FT200100834 Singer, Dr Ruth J	This project aims to find new ways to support the extraordinary diversity of Indigenous languages spoken in Australia. In Arnhem Land the ability to understand but not speak a language is widespread and plays a crucial role supporting linguistic diversity. This ability, receptive multilingualism, will be examined using an innovative interdisciplinary methodology, generating new understandings about the relationship between multilingualism and linguistic diversity that are crucial to tackling the global decline in Indigenous languages. The findings will help communities, educators and policymakers develop new strategies to support Australia's Indigenous languages which are vital to Indigenous health and wellbeing.	196,493.00	205,709.00	196,673.00	169,183.00	768,058.00

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	National Interest Test Statement This project contributes to Australia's national interest in the areas of health and wellbeing, training and employment and cultural heritage. It will support the use of Indigenous languages that is correlated with higher levels of wellbeing among Indigenous Australians, especially young people because connection to language and culture support a strong Indigenous identity. The research partnerships built with three remote Indigenous communities within this project include mentoring, training and employment to provide an emerging generation of Indigenous researchers access to the skills they need to make sure that their languages are spoken by the next generation. The strategies for language maintenance identified in the project will be useful to communities around Australia who are working to maintain their heritage languages. The project findings will help to ensure that Indigenous languages continue to be heard in the future, preserving the cultural heritage of all Australians.					
FT200100981 Wheeler, Dr Michael W	Exactly solvable stochastic processes are an important area of mathematical research, with cross-disciplinary links to quantum physics, quantum algebras and probability theory. These processes can be used to model a variety of real-world phenomena such as crystal growth and polymers in random media. This project aims to significantly expand our knowledge of exactly solvable stochastic processes by extending them to new algebraic frameworks. Among the outcomes of the project, we expect to identify new probabilistic structures which go beyond the famous Gaussian universality class. These theoretical developments allow better prediction of randomly growing interfaces, which encompass a range of phenomena from tumour growth to forest fires.	204,051.00	204,051.00	204,051.00	204,051.00	816,204.00
	National Interest Test Statement Predicting the behaviour of large systems of randomly interacting particles and growing interfaces are notoriously difficult problems in mathematical physics. While challenging, these problems are both ubiquitous in the world and fundamental to it. For example, traffic flow can be well approximated by one-dimensional systems of drifting particles, and a host of physical phenomena, from tumour growth to forest fires, can be modelled by stochastic interfaces. This project aims to deliver powerful new techniques for performing computations in random systems of these types, and to predict new types of physical phenomena that are still awaiting discovery in nature. The fundamental research in this proposal is at the forefront of international progress in mathematics. It will significantly strengthen Australian involvement in the very topical field of Integrable Probability, and provide a valuable training opportunity for higher-degree postgraduate students. A significant outcome of this project will be reinforced collaborative relationships with leading US and Japan institutions.					
	The University of Melbourne	2,695,125.00	2,729,275.00	2,697,534.00	2,615,228.00	10,737,162.00
	Victoria	7,839,312.00	7,849,765.00	7,733,274.00	7,545,795.00	30,968,146.00

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Western Australia						
Curtin University						
FT200100183 Bi, Dr Kaiming	Meta-based technique has been proposed for vibration control recently due to its special wave filtering effect. However, the current techniques are difficult to attenuate low-frequency waves, thus not suitable for civil structural vibration control. This project proposes incorporating an inerter-based element into the unit cell of a metastructure. Due to the unique mass amplification characteristic of inerter element, manipulating low-frequency waves becomes possible. Practical designs are developed and applied to control the adverse vibrations of engineering structures induced by three typical vibration sources. Comprehensive analytical, experimental and numerical studies are carried out to examine the effectiveness of the proposed method. **National Interest Test Statement** This project intends to develop novel inerter-enhanced metastructures to suppress the excessive vibrations of engineering structures induced by common vibration sources including traffic, earthquakes and sea waves. The developed method will lead to more economical design of vibration control devices, extended service lives of engineering structures, and prevent the possible catastrophic damages/collapses of engineering structures, it thus will have significant impacts on the construction industry, economy, environment and society; It will significantly advance current understanding in the field of solid state physics especially on the meta-based method for vibration mitigation, and ensure Australia at the forefront of fundamental and applied research; It will also find application in international construction practice, help local industry entering the competitive international market as well as potentially generating valuable intellectual property for Australia.	204,861.00	205,041.00	202,681.00	191,101.00	803,684.00
FT200100422 Ong, Prof Rachel	This project plans to fill major research gaps by delivering new evidence on the drivers of intergenerational housing wealth inequality. It aims to generate new knowledge on the ways in which baby boomers manage housing wealth, and shed light on their experiences of using wealth transfers to improve their children's housing outcomes. The project offers innovative cross-national analyses that should produce internationally relevant findings and foster collaborations on a significant scale. It is expected to provide major national benefits by promoting a shift away from short-term policy planning that unintentionally set generations against each other towards a more holistic policy perspective that meet the needs of co-existing generations. **National Interest Test Statement** This project directly addresses a key national priority of sustaining older generations' economic security without harming the housing prospects of the young. It offers direct national benefits by generating a rich evidence base that will support a shift in policy thinking from one that addresses the housing concerns of each generation in isolation, to a new platform that accounts for the housing needs of multiple surviving generations. Hence, it will encourage mutually responsive relationships between the young and old. The project's findings will support forward-looking policy development across a range of social and economic domains, including ageing, housing, financial security, intergenerational equity and intergenerational solidarity.	241,871.00	230,891.00	238,391.00	253,339.00	964,492.00
	Curtin University	446,732.00	435,932.00	441,072.00	444,440.00	1,768,176.00
The University of Western Australia						
FT200100055 Davies, Dr Luke J	The Universe is dying. All across the cosmos for the last 10 billion years galaxies have been continuously killed, and we still don't know why. Today the Universe is littered with dead galaxies, and their distribution is correlated with location (environment). This suggests that location is one of the prime suspects in this galactic whodunit. However, previous observations and techniques have restricted us to only measuring galaxy environments in the nearby Universe, inhibiting our ability to identify when, where and why they are killed. This project aims to use my new state-of-the-art Australian survey and innovative analysis techniques to measure the smoking gun factors that kill galaxies in the distant Universe for the very first time.	191,863.00	191,863.00	191,863.00	165,653.00	741,242.00

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(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
	National Interest Test Statement This fellowship capitalises on recent multi-million dollar government investments in astronomy (e.g. European Southern Observatory, Square Kilometre Array, Australian Space Agency), to maximise Australian participation, leadership, and return. It globally showcases two leading Australian technologies: astronomical instrumentation (i.e. optical fibre positioners used to collect data) and big data management. These technologies, adding an estimated $20m/yr to Australian industry, rely on the visible successes of large scale projects, such as those in this fellowship, to secure future large-scale engineering contracts for Australia - leading to future jobs, investment and benefit to the economy. The project will also produce novel techniques in data processing and analysis, leading to innovation in computing and data science, enhancing Australia's position in these global industries. Finally, this science is ideal for engaging the next generation; it will attract and train future research leaders, providing highly desirable and transferable skills to the Australian community.					
FT200100243 Moggach, A/Prof Stephen A	Porous materials have the potential to be used as exceptional carbon capture materials, as well as for trapping and releasing other useful gases, such as those used in medical applications. They work, because they contain small holes where these gases can be trapped. Unfortunately, finding gas inside these holes experimentally is incredibly difficult, making it challenging to make better porous materials. In this project, I will use extreme pressures to saturate these holes with gas molecules, allowing us to 'see' them. Not only will this mean that better porous materials can be designed and made, but will provide a unique approach to storing and trapping gases to be used in a variety of applications, from the energy to medical sectors.	248,153.00	257,332.00	259,332.00	265,332.00	1,030,149.00
	National Interest Test Statement This project brings together researchers from national and international Universities to develop a new approach to gas storage and release, resulting in a step-change in the methods used to design, and manufacture porous materials, with applications in carbon capture, energy materials and in delivering medical gases. The aim is to apply extreme pressures to porous materials. An approach requiring a unique laboratory facility. In Western Australia, I have now designed, built and tested high-pressure equipment which will provide a unique facility (with regular access) to Australian researchers interested in applying pressure to any material. Because of the focus of this project on toxic gases, energy materials, carbon capture technologies, and the manufacture of pressure cell technology, the project aligns well with the Australian Government's National Science and Research Priorities, in particular Energy, Advanced Manufacturing and Environmental Change. Funding of this research will therefore have a wide-reaching economic, commercial, environmental and social impact to the Australian community.					
FT200100375 Robotham, Dr Aaron S	In this project I will be uncovering the fate of satellite galaxies over cosmic time - a major question in astronomy. I will determine whether their mass is lost to direct mergers, or if their stellar material is spread about the dark matter halo they reside in. To tackle this project we will be using two main threads: observing how the occupation of satellite galaxies evolves over time by using data from two major Australian 3D galaxy surveys, and using analysis from the largest ever Hubble Space Telescope (HST) archival project to directly detect the faint fuzz of stellar material in these halos. Both these threads involve advanced computation, and will train the next generation of researchers in skills applicable in many domains.	222,101.00	223,101.00	223,101.00	198,101.00	866,404.00
	National Interest Test Statement In 2018 the federal Megan Clark Review highlighted the space industry, in particular satellite development and exploitation, as a key part of Australia's economic future. The research proposed here will generate tools and knowledge essential to support and grow the next generation of space research for the Australian space industry, which currently attracts $10m/yr in government funding and $5b/yr from industry. This fellowship is fundamental to the largest Hubble Space Telescope (HST) project ever awarded and will launch a major international collaboration with research agencies including NASA. This, along with the development of innovative computing tools, will help strengthen Australia's expertise in satellite image analysis, and could potentially bring further revenue to the Australian space industry. These tools will also provide key software for HST's $20b replacement: the James Webb Space Telescope (launch 2021). The image analysis tools developed will also have potential commercial applications in biomedical imaging ($60b/yr) and geospatial imaging ($15b/yr) industries.					
FT200100573 Gaynor, A/Prof Andrea	This project aims to understand relationships between people and nature in modern cities through their history. In an increasingly urbanised world, nature in cities is crucial for biodiversity conservation and ecosystem services, but today's urban wildlife, trees and reserves—and residents' relationships with them—are legacies of a largely unknown past. By providing insights into the drivers of urban residents' everyday relationships with nature from 1880-2020 and engaging the public through historical narratives, the research will inform current urban greening, conservation and restoration projects and policy. The project expects to promote urban sustainability and produce vital new insights into changing urban cultures and environments.	240,517.00	251,000.00	253,043.00	233,148.00	977,708.00

* Note - Indicative funding for approved projects will be made available through a funding variation under section 54 of the ARC Act

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	National Interest Test Statement					
	This fellowship will innovatively use history to address the real-world problem of reconciling human and environmental needs in cities. It will enable us to learn from the past about the risks and opportunities associated with urban nature such as remnant bushland, waterways and wetlands, urban forest and wildlife. It will empower and inspire communities and residents concerned with urban greening, conservation and restoration by preserving and promoting their local stories, and highlighting the scale and impact of past projects. Through exhibitions, publications and working directly with stakeholders, this historical research will assist local governments, NGOs and residents of Australian cities to engage in management and restoration of urban nature to achieve liveability, climate resilience and biodiversity objectives. It will also strengthen and expand Australia's international research networks in the growing and dynamic field of environmental history, and provide high quality research training.					
	The University of Western Australia	902,634.00	923,296.00	927,339.00	862,234.00	3,615,503.00
	Western Australia	1,349,366.00	1,359,228.00	1,368,411.00	1,306,674.00	5,383,679.00
		22,760,900.00	**22,873,040.00**	**22,748,129.00**	**22,130,324.00**	**90,512,393.00**

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