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Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
Australian Capital Territory						
The Australian National University						
FT220100010	**Time to shine for constrained peptides as next-generation pharmaceuticals**	198,904.00	196,404.00	208,904.00	198,904.00	803,116.00
Nitsche, Dr Christoph	Current methods for the screening and generation of peptide and protein drugs are laborious, expensive and often incompatible with the biological systems used in pharmaceutical industries. Leveraging recent advancements in chemistry and molecular biology, this project aims to improve the design, synthesis and screening of peptide-based pharmaceuticals. Key research outcomes are innovative biocompatible chemical transformations for the screening of large peptide libraries, to unleash the revolutionary potential of constrained peptides in drug development. Expected benefits are reliable and cost-effective technologies for the rapid production of biologically active molecules for future targeted use in human and agricultural pharmaceuticals.					
	National Interest Test Statement					
	Recent global health threats have impressed upon Australia the need for on-shore capability, and a significant market opportunity, in peptide-based drug and vaccine manufacturing. However, a major bottleneck to capability and commercial growth lies in peptide engineering, a laborious, complicated process to improve peptide drugs. This Fellowship will discover and establish a unique chemical toolbox for peptide engineering and demonstrate its advantage for generating new bioactive peptides. Translated into a powerful technology platform, the Fellowship will support Australia's pharmaceutical and biotechnology industries to access and develop competitive capabilities in peptide engineering through easy, cost-effective and environmentally sustainable methods. This will enable Australian firms to rapidly scale R&D efforts and increase market share. These outcomes will benefit Australia commercially through increased innovation and global competitiveness and in terms of economic and health security through reliable on-shore drug and vaccine development and production to manage current and future human diseases.					
FT220100024	**Kin and connection: Ancient DNA between the science and the social**	269,093.00	271,793.00	270,343.00	245,981.00	1,057,210.00
Frieman, A/Prof Catherine J	This project aims to capitalise on the emerging wealth of ancient DNA data to build bridges between social and scientific archaeologies. It expects to create new knowledge by integrating genetic data with social models of kinship, applying an innovative, cross-disciplinary methodology to the uniquely rich and well-documented archaeological record of prehistoric Europe. Expected outcomes include a new framework for understanding past kinship and the formation of a new interdisciplinary and international research network. Significant benefits include increased value of legacy collections, capacity building in archaeology, and positioning Australia at the forefront of major developments in ancient DNA and archaeological science.					
	National Interest Test Statement					
	Ancient DNA has captured the public's imagination through podcasts, popular books, and major media coverage but it only reveals biological connections, not the social ties that held past communities together. This project seeks to create new knowledge about past and present family and community relationships by bringing together ancient DNA data and archaeological insights. By integrating scientific DNA data and archaeological knowledge about past people's settlements, technologies, and family structure, the project will create a more accurate understanding of the human past. Through collaboration with curators and museum professionals, the project will share these discoveries and stories with the 4.5 million Australians who frequent our national museums each year. It will contribute tangible cultural benefits for Australian museums by increasing the value of existing collections; and, in doing so, it will enrich the Australian public's understanding of the social worlds of ancient people.					

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FT220100276	**Quantifying the impact of phenotypic plasticity on population persistence**	194,986.00	194,986.00	194,986.00	179,046.00	764,004.00
Noble, Dr Daniel W	This project aims to understand how environmental sensitivity in growth, survival and reproduction of individuals in a population influence population dynamics using terrestrial ectotherms. It will provide significant new insights into whether phenotypic plasticity promotes population persistence in the face of environmental change. Expected outcomes include approaches for incorporating environmental effects in population models for threatened species, open databases that can be used to estimate demographic information for species lacking data, and an assessment of what characteristics make some species more sensitive to the environment than others. Benefits include quantitative training and tools for managing Australia's rich biodiversity.					
	National Interest Test Statement					
	Environmental change directly affects Australia's biodiversity and its ability to withstand its impacts and survive. Yet conservation managers tend to overlook environmental effects on populations when predicting population dynamics of threatened and invasive species. This Fellowship will tackle this omission with sophisticated modelling and experiments to understand how environmental sensitivity in growth, survival and reproduction affects population resilience using Australia’s reptile fauna as model systems. Generating new knowledge about fundamental biological theory, the project will design data and modelling practices for adoption among Australian conservation managers to 1) help them more accurately predict and bolster Australia’s threatened species populations and 2) promote the use of more efficient management strategies. In doing so, the project will contribute to the generation of economic and environmental benefits in the form of cost saving species management strategies and improved conservation outcomes while positioning Australia as a world leader in best-practice biodiversity management.					
FT220100656	**Control and learning for enhancing capabilities of quantum sensors**	236,981.00	238,338.00	243,481.00	257,269.00	976,069.00
Dong, A/Prof Daoyi	This project aims to develop new theories and algorithms to enhance capabilities in engineering quantum sensors from the perspective of systems and control. The project is significant because it is anticipated to advance key knowledge and provide systematic methods to enable achievement of high-precision sensing for wide applications, e.g., early disease detection, medical research, discovery of ore deposits and groundwater monitoring. The intended outcomes are fundamental theories, effective control and learning algorithms for achieving highly-sensitive sensors. These outcomes should make important contributions to and deliver new knowledge and skills for Australia's sensing industries, which could benefit Australia's economic growth.					
	National Interest Test Statement					
	According to Australia’s 2020 Quantum Technology Roadmap, our quantum sensing industry has the potential to generate over $0.9 billion revenue and 2900 new jobs by 2040. Quantum sensing has many potential applications including in early detection of diseases, groundwater monitoring and iron ore discovery. However, it is unclear what the physical limits of emerging quantum sensors are, and how to minimise their production costs. This project will characterise fundamental limits of quantum sensors and develop control and learning methods for producing efficient and reliable quantum sensors with minimum resource requirements. The discoveries made in this project, which will be translated to support policy decision-makers and sensing industry manufacturers, will offer the Australian government and key industries a better understanding of what capability quantum sensors can achieve, and create new knowledge for developing highly advanced quantum sensors for commercial advantage. These outcomes will support Australia to realise the economic, industrial and workforce benefits envisaged by its Roadmap.					
FT220100670	**Quantum entanglement with atoms: from individual pairs to many-body systems**	207,559.00	207,610.00	207,989.00	191,961.00	815,119.00
Hodgman, Dr Sean S	The aim of this project is to use ultracold helium atoms to test aspects of quantum entanglement. The unique properties of metastable helium will provide significant new knowledge of this fundamental quantum property. Expected outcomes include measuring a Bell test between momentum entangled atoms and showing how many-body entanglement builds up following a quantum quench. This should provide benefits including new theories that attempt to unify quantum mechanics with general relativity and will be relevant for emerging quantum technologies such as more powerful quantum computing or quantum simulation of complex systems.					

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	National Interest Test Statement The emerging field of quantum technology is predicted to become a $4 billion industry in Australia and provider of 16,000 new jobs by 2040. Many of the benefits that Australia expects quantum technologies to offer us, such as secure data transmission or fast computing performance, stem from the little understood property termed quantum entanglement – the phenomenon where quantum particles can be linked such that changing one will instantly change the other, even if they are separated by a large distance. A foundational understanding of entanglement is crucial to the development of quantum devices. This Fellowship will use cutting edge methods in quantum technology to investigate little-known basic properties of entanglement and produce fundamental knowledge that will guide the Australian industry's development of new quantum technologies, for example in the design of quantum computers. Such quantum computers will potentially benefit everyday Australians in a range of ways, from faster drug and vaccine development to more efficient stock market forecasting and faster transport networks.					
FT220100774 Gamlen, A/Prof Alan J	**Mobility Shocks: Understanding disruptions to Australian migration** This Fellowship aims to generate new knowledge about the impacts of the Covid-19 pandemic on human migration and mobility, in order to advance understanding of major disruptive changes to population movement more broadly. Fellowship outcomes will include designing innovative geospatial research methods, linking and analysing cutting-edge datasets, and building cross-sector collaborations, in order to develop a new theory of 'Mobility Shocks'. This will benefit Australia and its migration partners with new ideas, tools, evidence and expertise to help scholars, policy makers and practitioners to understand, anticipate, and manage future disruptive changes to human migration and mobility in the Australian context and beyond.	250,351.00	249,719.00	249,378.00	247,126.00	996,574.00
	National Interest Test Statement The Covid-19 pandemic has caused massive disruptions to migration and mobility. Australians have experienced these disruptions first-hand through border closures, skills shortages, working from home, and even relocating from cities to smaller regional areas. However, the data to inform Government decision making and its provision of support to Australians affected by these disruptions are patchy and often unavailable. This Fellowship will produce this missing data on Australia's changing migration and mobility needs, including through innovative data visualisations and maps of changing movements of Australians both overseas and at home. These tools will enable policy makers, employers and community leaders to identify how their constituencies are moving, what services they need, and be better equipped to respond to them. These outcomes will benefit Australia and everyday Australians through better national preparedness to respond effectively and with resilience to future disruptions to our migration and mobility.					
	The Australian National University	1,357,874.00	1,358,850.00	1,375,081.00	1,320,287.00	5,412,092.00
	Australian Capital Territory	1,357,874.00	1,358,850.00	1,375,081.00	1,320,287.00	5,412,092.00

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New South Wales						
Macquarie University						
FT220100119	**Protecting Global Wetlands, 1945 to the Present**	198,042.00	198,042.00	214,272.00	200,699.00	811,055.00
O'Gorman, Dr Emily	This project aims to provide the first in-depth environmental history of international wetlands conservation post-World War II. Focusing on the key concepts of animal migration, ecosystems, and wise use, and grounded in the important case study of the Ramsar Convention, the project expects to generate new theoretical and applied insights about wetlands conservation and expertise, and nurture exciting new directions in environmental history. Anticipated outcomes include a clearer understanding of why wetlands became a focus of international conservation and the consequences. This will bring significant benefits to wetland managers and communities by contextualising competing wetlands futures and via policy recommendations.					
	National Interest Test Statement					
	This project will reveal the untold history and consequences of international wetlands conservation efforts through the key case study of the Ramsar Convention (an international treaty for the conservation and sustainable use of wetlands), including economic, social, ecological, and regulatory aspects. Australia has 66 Ramsar-listed wetland sites, all managed in accordance with international obligations. The project will inform Australian conservation policy and processes as well as economic development by focusing its novel analysis on three key environmental concepts that have profoundly shaped global wetlands conservation agendas: ecosystems, animal migration, and wise use. The project's insights are vital for wetland managers and policy makers in Australia who seek to protect these ecosystems now and in the future. The project will inform adaptive management processes; local, national, and international conservation and regulatory policy; economic development and access strategies; wetlands regeneration projects; and Indigenous-led initiatives.					
FT220100152	**Microbial junk food: developing synthetic platforms for plastic degradation**	222,911.00	225,342.00	247,205.00	240,345.00	935,803.00
Cain, Dr Amy K	This project aims to establish the genetic basis of polyethelene biodegradation (PED) by microbes from the gut microbiome of plastic-eating caterpillars. It will transform the active microbial PED genes into carefully designed synthetic microbes for efficient, safe and large-scale PED. The project will combine innovative functional microbial genetic tools and synthetic biology techniques with solid biochemistry and bioinformatics to produce translatable synthetic platforms containing key genes optimised for efficient PE waste removal. The outcomes will have the potential to transform the relative ineffective and expensive current methods for PE disposal into flexible, cost-effective and sustainable solutions applicable to multiple sectors.					
	National Interest Test Statement					
	Over 5.8 billion tonnes of plastic has been produced since 1950, yet less than 10% is recycled today. However, nature offers a potential biological solution to combat this plastic waste. This project will establish the genetic basis of microbial plastic degradation and harness this information to produce flexible and efficient synthetic biology technologies that can safely and sustainably degrade commonly used plastic. Microbes from the gut of a plastic-degrading caterpillar will be investigated for the first time to identify the genes and enzymes that allow for plastic degradation. The project will design and build synthetic microbes to optimise plastic degradation efficiency. This cutting-edge technology will have great commercial potential, positioning Australia as a leader in new plastic waste reduction strategies. It will ultimately benefit Australian waste removal and recycling industries, and benefit Australian society and the environment by tackling the accumulation of plastic that damages terrestrial and marine environments and harms human and animal health.					

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FT220100427	**Arab/Muslim Australian Social Movements since the 1970s: a hidden history**	215,000.00	202,000.00	195,000.00	190,000.00	802,000.00
Abdel-Fattah, Dr Randa	This project will be the first study of a neglected but constitutive part of Australia's social movement history: Arab/Muslim Australian social justice activism. It aims to recover previously untapped oral histories and rare archival collections of Arab/Muslim Australian activists working in anti-racism, anti-war and feminist social movements from the 1970s to date. Expected outcomes include new knowledge about how this activist community has struggled against external systems and internal conflicts to build a socially just future in multicultural Australia. Anticipated social and cultural benefits include a greater understanding of the transformative activism of communities whose movement work is often relegated to the margins.					
	National Interest Test Statement					
	In a world characterised by vast inequalities, we are witnessing urgent local and global debates on how marginalised communities can work together across social justice movements. The project aims to investigate how Arab/Muslim Australian activists, working in anti-racism, anti-war and feminist social movements from the 1970s to date, have mobilised a range of diverse groups (such as Indigenous activists) to establish partnerships that impact local, national and global politics. Through a public exhibition that will tour Australian museums, an open-access website and writing workshops with marginalised communities, the project will demonstrate the importance of social justice activism as part of Australia's history and how it shaped Australia's current democratic and political culture. The study will provide significant social and cultural benefits to members of the wider Australian community by offering a roadmap for how contemporary minority communities can work to build a socially just future in multicultural Australia and negotiate the politics of exclusion and inclusion and nurture united relationships.					
FT220100543	**Storytelling networks and community crises in ancient Greece**	233,042.00	228,042.00	228,042.00	233,042.00	922,168.00
Hawes, Dr Greta H	This project aims to investigate how communal crises impact storytelling through an analysis of Greek myth in antiquity (800BC-AD400). Using an innovative digital platform that structures mythic data as narrative networks, it expects to generate new knowledge about the impact of natural disasters, epidemics, migration and war and show how narratives work as strategies for resilience. The outcomes include a new method for modelling narrative networks against community disruption and revealing the preservative effects of social and cultural infrastructures. It will provide significant benefits, such as an improved understanding of how historical contingencies determine which stories survive, and better public access to research on Greek myth.					
	National Interest Test Statement					
	This project explores the intersection of two key human practices: our habit of storytelling and our desire to create communities resilient to crises. It will reveal how storytelling responds and adapts to crises caused by natural disasters, disease, war and migration using data from Greek myths in antiquity (800BC-AD400). Using innovative software, it will model narrative networks against community disruption; provide insights into how Australian communities use stories to build their identities and express their place in the world; and potentially predict how communities respond to and overcome crises. Disasters experienced by Australians, bush fires, drought, floods and the pandemic, have disrupted communities, and with the digital age and new technologies, our usual storytelling practices have changed. This project will benefit Australian culture and society by establishing a framework to document disaster recovery, support the maintenance of local traditions and knowledge over generations, and suggest strategies to help communities in crisis foster resilience and rebuild their collective sense of self.					
FT220100669	**Swarm construction: ant-inspired processes for teams of building robots**	204,978.00	206,438.00	194,942.00	199,603.00	805,961.00
Reid, Dr Christopher R	Construction and manufacturing can be dangerous, wasteful industries—prime candidates for automation by teams of mobile robot builders. However, our understanding of how to program robots for teamwork is limited. This project aims to understand how colonies of weaver ants build complex nest structures, using novel 3D-imaging and ant tracking techniques. The anticipated outcomes of the project are i) a framework for how individual-level behaviour drives structure-level outcomes, applicable to many complex systems, and ii) novel software and hardware for robot swarms that can 3D-print structures using ant inspired teamwork strategies. Benefits of the project include new construction technologies that are safer, greener, cheaper and faster.					

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	National Interest Test Statement The country faces a construction crisis that is a double-edged sword - increases in urbanisation, homelessness and natural disasters demand vast construction efforts, yet current construction methods are expensive and lengthy, as well as among the most dangerous and wasteful work industries in Australia. Solving this problem will require the innovative development of teams of autonomous building robots. However, our understanding of how to program robots for teamwork is limited. This project aims to understand how colonies of weaver ants build complex nest structures, using novel 3D-imaging and ant tracking techniques. The project will reveal how many autonomous units (ants) collectively build functional nest structures and will deliver bio-inspired designs to create the first robot swarm that can autonomously build structures using decentralised, team-based strategies. This project will connect Australia with industry partners in robotics and additive manufacturing, with benefits to include fewer deaths, less environmental waste, lower costs, increased capacity, and novel export technologies for Australia.					
	Macquarie University	1,073,973.00	1,059,864.00	1,079,461.00	1,063,689.00	4,276,987.00
The University of New South Wales						
FT220100009	**Multi-scale ensemble modelling of coastal systems in a changing climate**	233,042.00	233,042.00	233,042.00	233,042.00	932,168.00
Splinter, Dr Kristen D	This project aims to incorporate sandy shoreline adaptation by developing a time-varying framework for model ensemble averaging. This will significantly advance our ability to predict shoreline change over a range of management timescales from days to decades along high-value coastlines. This project expects to generate new knowledge in Coastal Engineering using new methods to train models and deliver unprecedented new shoreline data. The expected outcomes are enhanced capacity to predict shoreline change over a range of timescales and a better understanding of how sandy coastlines adapt to future climate variability. This should provide significant benefits by enabling a better assessment of coastal hazards along our high-value coastline.					
	National Interest Test Statement Australia as a continent surrounded by ocean has more than 10,000 sandy beaches that play a key role in our economy. A 2006 study by the NSW Government placed beaches as one of the four most valuable natural resources in the state. Our beaches, however, are under threat due to increased coastal development on land and beach erosion from the sea, resulting in extreme pressure to properly manage this high value natural asset. To successfully manage our coastline now and into the future, we need the ability to be able to predict how our sandy beaches will change because of wave action and rising seas. This Future Fellowship aims to build new models based on the best available data derived from over 35 years of satellite images. The outcomes of this project will immediately benefit coastal communities and the insurance industry around Australia by providing reliable predictions of sandy coastlines for the future so they understand the risks to assets (houses, roads, etc). The methods developed will shape international best-practice with regards to model evaluation and forecasting relevant to decision-making.					
FT220100092	**Engineering nanomaterial interactions with the cell surface**	270,343.00	274,093.00	271,593.00	254,981.00	1,071,010.00
Lord, A/Prof Megan S	This Fellowship aims to advance understanding of the endothelial cell surface, a key tissue barrier, and its interactions with nanomaterials. Enabled by cross-disciplinary collaboration, it expects to develop knowledge in matrix biology of the cell surface and materials as well as new methods to analyse their interactions. This is expected to unravel causal relationships between nanomaterial features and interactions at the cell surface which will be integrated to engineer optimised materials. This will address the current and critical challenges of nanomaterial technologies in the efficient and targeted interactions with cells with long-term benefits for the consumer, biotechnology and healthcare sectors.					
	National Interest Test Statement This project will study how very small particles (nanomaterials) interact with the cells of animals & humans, developing methods to control these interactions via engineering changes in the materials or modifying how the surface of the cells react to them. Project outcomes will inform the development of nanomaterials for applications in consumer & biotechnology areas, including self-care products such as mouth & wound rinses, cosmetics, food/environmental safety monitoring, & in the future for novel systems to deliver genes into cells. Pathways to impact & future commercial benefits for Australia will be realised through technology licensing to existing & new industry partners. Specific advances will be made in the areas of a polymer platform for the self-care products & tailored cell surfaces in Australian high value-add cell technology manufacturing. With the global market of materials for biological application projected to be worth over $270 billion by 2026, this is a key area of investment for Australia to support local advanced manufacturing industries in a national priority area.					

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FT220100094	**Nano-toughening of Conductive Composites with High Electrical Ductility**	169,598.00	199,410.00	202,410.00	194,410.00	765,828.00
Peng, Dr Shuhua	This project aims to develop a new technology to effectively toughen conductive thin films including metals and conductive polymers with significantly improved mechanical robustness for next-generation stretchable electronics. This new technique will tackle the major limitation of stretchable electronics propensity to abrupt electrical failure caused by plastic deformation and long channel cracks in conductive thin films of low yield strain and ductility. By overcoming the bottleneck issue of low stretchability and ductility of existing conductive thin film materials, it will be possible to significantly expand the design space of flexible and stretchable electronic devices.					
	National Interest Test Statement					
	Stretchable electronics are increasingly used in flexible displays, smart medical garments, and wearable sensors. The global market is expected to reach US$2.9B by 2026. Stretchable conductive materials are one of the key components for these devices and need ‘stretchability’ similar to that of human skin and clothes, to function effectively. However, commonly used materials such as conductive polymers and metals cannot withstand large deformations. This project aims to develop a new toughening technology to dramatically increase the stretchability of these conductive materials. This will significantly expand the design and manufacturing space of flexible and stretchable electronics, such as skin-interfaced wearable sensors, smart garments for chronic diseases, and soft robots for rehabilitation. It is expected that valuable intellectual property and technological leadership will arise from this project. Research outcomes will be rapidly translated into novel products through established collaborations with the industry partners of a newly established ARC Research Hub for Connected Sensors for Health.					
FT220100100	**Reimagining strengths approaches to drug and alcohol care for young people**	290,000.00	275,000.00	275,000.00	275,000.00	1,115,000.00
Bryant, A/Prof Joanne	This project aims to advance the conceptualisation and practical application of strengths-based approaches in the youth alcohol and drug sector. These approaches provide a promising way forward for addressing substance use and disadvantage among young people, and are widespread in the sector, but lack a strong evidence base. The project will learn from excellence in Aboriginal strengths-based models, and draw on sociological frameworks, to generate evidence on which to build more relevant responses for disadvantaged young people. This will provide significant benefit to service providers and policymakers by providing evidence about how to do strengths-based practice that is responsive to the needs of disadvantaged young people.					
	National Interest Test Statement					
	Socially disadvantaged young people are over-represented in alcohol and drug (AOD) treatment services. Their substance use is often connected to other challenging life conditions such as crime, mental ill-health, and poverty. While treatment staff work very hard to support these young people, they believe that current approaches are lacking and urgently want alternative ways of responding. This study will directly address this by progressing the evidence about strengths-based approaches, which aim to draw on people’s resources and resilience to support their treatment journeys. Strengths-based approaches are thought to be more acceptable to young people and better to address their social and economic needs, but are significantly under-researched. The project will directly benefit youth AOD service providers by outlining more relevant and responsive models of service delivery for disadvantaged young people, so to progress the quality of these approaches in the sector.					
FT220100159	**Sensing biomechanical forces in the heart**	207,142.00	207,142.00	209,142.00	208,642.00	832,068.00
Cox, Dr Charles D	Mechanosensitive ion channels are key molecules that define how each heart cell interacts with their physical environment. Yet how they enable cells to decode biomechanical cues remains poorly understood. At the heart of this problem is a lack of tools to quantify the force required for activation. This project aims to develop novel technologies to record the activity of these essential channels in a critical cell type within the heart, and use this information in addition to micro-engineering approaches to fully understand the role of these channels in force sensing and generation, at both the single cell and micro-tissue levels. This knowledge and technology has broad utility that extends far beyond cardiac biology into multiple fields.					

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	National Interest Test Statement Cells can sense occasional (e.g. due to injury) and repeated (e.g. heartbeat) forces using molecules on their cell surface. Currently, no technologies are available to study the effect of occasional and repeated mechanical forces (e.g. stretch/compression) on healthy heart cells, limiting our understanding of heart development and function. This research will develop new techniques to study and understand how healthy heart cells sense and respond to mechanical forces. Findings will uncover new molecules important for sensing mechanical forces and determine how they work at the molecular level. Studying these molecules is fundamental to improve understanding healthy heart cells and is critical to the future development and commercialisation of next-generation biocompatible materials for implants, artificial tissues and heart valves. Given Australia's pioneering status in developing the bionic eye and pacemaker technologies, this fundamental project will continue to ensure our global leadership in these sectors, directly benefitting the local bioengineering industry and healthcare innovation.					
FT220100209 Han, Dr Zhaojun	**2D vertical heterostructures for multi-functional energy applications** This project aims to develop multi-functional 2D vertical heterostructures for sustainable energy applications. A key challenge in fabricating 2D vertical heterostructures is the re-stacking of layered materials. This project will utilize edge-rich vertical graphene to unleash the full potential of 2D vertical heterostructures by combining the advantages of individual building blocks while mitigating the associated shortcomings. Expected outcomes will include improved electrochemical performance of materials and an integrated energy system utilizing these multi-functional materials to produce green hydrogen at low cost and high efficiency. The project should contribute largely to Australia's transition to robust and affordable clean energy.	231,654.00	239,654.00	236,654.00	239,654.00	947,616.00
	National Interest Test Statement Green hydrogen is at the centre of Australia's sustainable energy strategy and net-zero emission plan. This project aims to develop multi-functional 2D vertical heterostructures that can simultaneously store energy and generate hydrogen using renewable electricity. These novel materials can be integrated into devices to generate hydrogen in a highly efficient and cost-effective manner. By working with local industry, these novel materials will be translated into devices that can produce green hydrogen at low cost and high efficiency, ensuring Australia's competitiveness in the multi-billion-dollar market of robust, reliable and affordable hydrogen energy systems. It is anticipated that the project will underpin the development of advanced materials and electrochemical energy storage, bringing considerable benefits to the local energy sector while establishing Australia as a superpower in the renewable energy export market. The project will accelerate Australia to realise its hydrogen potential and reap rewards for the economy, the community and the environment to 2030 and beyond.					
FT220100388 Pearson, Prof Joel	**Understanding the role of mental imagery in cognition and behaviour** This project aims to develop objective physiological methods to measure mental imagery, uncover its brain mechanisms using neuroimaging and show how it biases cognition. It has long been suspected that mental imagery biases cognition, visual working memory and perception. However, showing this has been difficult due to a lack of measurement techniques. Here this is overcome by developing novel assay technologies and applying them to the extremes of imagery, Aphantasia (no imagery) and Hyperphantasia (strong and vivid imagery). Expected outcomes include new measurement tools for generations of scientists, understanding the brain mechanisms of imagery and showing how our cognition (memory, risk, investing) is biased by mental imagery.	250,731.00	292,394.00	270,610.00	267,200.00	1,080,935.00
	National Interest Test Statement The capacity to create and use mental images is central to how we think, feel, and act. Yet, there are no objective methods to measure this imagery or to understand in detail how it shapes our thoughts and actions. This proposal will address this gap in knowledge. It will develop new objective methods to measure mental imagery, apply these methods to advance understanding of the brain basis of imagery in healthy humans, and show how this imagery can improve decisions, emotional control and mental performance. Understanding and measuring mental imagery will allow the development of training that maximises the potential of imagery to improve cognitive performance and decision making. Research outcomes will be disseminated to key stakeholders across business, education and health sectors to enable the co-design of tools to harness people's use of mental imagery to enhance cognition and decision making, improving productivity in workplace and educational settings, as well as emotional resilience and well-being.					

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(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
FT220100474	**Uncovering a novel memory process mediating stimulus-based decisions**	232,875.00	226,948.00	227,198.00	233,847.00	920,868.00
Laurent, Dr Vincent	The project aims to describe how environmental stimuli influence choice between actions. The goal is to demonstrate that this influence recruits a novel form of memory characterised by a durable change in the expression of an opioid receptor. It will combine sophisticated behavioural tasks with modern genetic tools in rodents to identify the molecular, cellular and neural interactions underlying the acquisition, maintenance and retrieval of this memory. The project expects to provide new insights into the brain machinery promoting motivated behaviours and adaptive decision-making, and to extend knowledge about the physiological underpinnings of our memories.					
	National Interest Test Statement					
	People use cues (pictures, objects and people they see around them) to help guide their actions and decisions. This skill is central to decision making, but we do not understand how the brain controls this ability. This proposal aims to address this gap, providing evidence that a novel memory system may mediate the way cues impact decisions and influence our choices and actions. Decision making processes coordinate our everyday life and help to ensure our health and well-being. Their failure is associated with ageing, obesity and conditions such as drug abuse and obsessive compulsive disorders. Understanding how cues influence decision making will enable us to better predict and control that influence, and to identify novel strategies to optimise and support appropriate choice. Research outcomes will be disseminated to key stakeholders across business, education and health sectors to enable the co-design of tools to improve decision making about, for example, healthy lifestyle and exercise choices, opportunities in education and lifetime skills training and medium-long-term financial planning.					
FT220100475	**Marine heatwaves: subsurface structure and interactions with other extremes**	261,093.00	265,093.00	265,093.00	251,724.00	1,043,003.00
Sen Gupta, A/Prof Alexander R	Marine heatwaves routinely cause major ecosystem degradation affecting valuable industries. The aim of this project is to extend our understanding to the workings of temperature extremes hidden below the ocean surface and how other concurrent ocean and terrestrial extremes interact with these marine heatwaves. The project will generate significant new knowledge around the mechanisms driving subsurface heatwaves and how they interact with ocean acidification, oxygen and terrestrial extremes. The outcomes would include improved forecasting of ocean extremes and a quantification of the multivariate risks posed to marine species. This will help guide mitigation or adaptation strategies, benefitting exposed industries like fisheries and tourism.					
	National Interest Test Statement					
	This project aims to better understand what causes ocean heatwaves and other extreme events that can damage marine ecosystems and industries that rely on them, like tourism (e.g. via coral bleaching) and fisheries (e.g. via fish mortalities). The project outcomes will facilitate improved forecasting of extreme temperature, acidification, and low oxygen events that can impact marine ecosystems. Past research has focussed on the ocean surface but neglected i) the subsurface where many commercially important species reside, or ii) the synergistic extremes in ocean acidification and low oxygen that can amplify negative temperature impacts. Through our ongoing collaborations with critical stakeholders like the Bureau of Meteorology and CSIRO, our research to improve forecasts of heatwaves and other extremes can directly benefit Australian marine users: managers of natural and economic resources can access improved forecasts to take short-term action to reduce negative impacts. Improved knowledge of the long-term risks of extreme conditions will guide mitigation and adaptation strategies for exposed industries.					
FT220100479	**Nanobionic plants**	250,809.00	251,859.00	248,029.00	235,179.00	985,876.00
Liang, Dr Kang	This project aims to develop nanobionic plants as network of semi-permanent sensors capable of rapid, sensitive, selective and unmanned detection and detoxification of chemical warfare agents in aquatic environments and in open air on-site, to allow timely and effective countermeasures. The anticipated goal is to advance the field of advanced manufacturing, environmental change, and nanotechnology with potential to support new national defence capabilities and to value-add Australian manufacturing industries with innovative, disruptive technologies that lead to achievable opportunities to address its unique needs and to claim Australia's position within the competitive global manufacturing and defence technology market.					

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	National Interest Test Statement This research project will produce technological advances that will lead to the development of totally new types of tiny ‘sensors’ built-in to living plants, capable of self-sustainable detection and clearance of toxins and pollutants from the environment. These toxins include waste products from agricultural, manufacturing and mining industries, as well as lethal chemical and biological agents such as mustard gas threatening Australia’s defence and national security. This research will realise technological breakthroughs in sensor development, and provide a sustainable, economic and reliable solution to monitor and improve air, water and soil quality. Outcomes in advanced sensors are closely aligned with the recent multi-billion-dollar investments in Australia’s defence and modern manufacturing capabilities. To commercialise these innovative and disruptive plant sensors, we will seek license agreements with existing Australian manufacturing and defence industries through established collaborations, facilitating Australia’s position within the competitive global manufacturing and defence technology markets.					
FT220100599 Pla, Dr Jarryd J	**Performing cold microwave measurements with warm diamonds** Detecting weak microwave signals at room temperature is an exceptionally difficult task, due to the excessive thermal microwave noise that exists all around us. At present, the best microwave receivers must be cooled to cryogenic temperatures, restricting their widespread use. This project aims to apply diamond-based quantum technologies to achieve unprecedented microwave signal detection sensitivities with a room-temperature setup, providing more accessible ultra-low noise detectors. The ability to measure weak microwave signals is crucial for a range of sectors and the results of this project are expected to have applications in defence (radar), space exploration (satellite communication), and fundamental research (spectroscopy).	240,000.00	240,000.00	240,000.00	232,000.00	952,000.00
	National Interest Test Statement This project aims to use quantum technologies to greatly improve the effectiveness of sensors that detect microwave signals. Detecting microwaves is needed for key areas of national importance, including defence (radar), space exploration (satellite communication) and microscopes for medical research. Sensors developed in this project will work at ordinary temperatures and provide more compact microwave detectors that are more practical for end users. Australia is in a strong position to benefit from the rapidly growing quantum technology industry to become a world-leading 'quantum economy', and this project will produce prototypes of Australian-made microwave sensors that can be commercialised within a few years, for example by creating a startup company. By training quantum engineering experts and by improving the knowledge of how to manufacture advanced quantum technologies, the project will help to build Australia’s quantum industry and provide more new employment opportunities.					
FT220100615 Bronstein, Dr David J	**Virtue with Aristotle: Recovering an Ancient Ethical Theory for Our Time** This project aims to show how Aristotle’s theory of virtue can guide our individual and collective attempts to live good human lives in challenging times. This project expects to produce the first comprehensive study of Aristotle’s concept of virtue in all three areas of human activity in which he applies it (moral action, theoretical cognition, and craft and artistic production) and to show its relevance for contemporary ethical theory and practice. Expected outcomes of this project include enhanced understanding of the concepts of virtue and flourishing and their historical roots in Aristotle’s ethical writings. This should provide significant benefits, such as building our collective resilience.	200,809.00	181,978.00	197,216.00	197,016.00	777,019.00
	National Interest Test Statement This project will produce the first comprehensive study of Aristotle's theory of virtue, covering all areas of human ethical activity. It will build on sustained public interest in the importance of ethical decision making and aims to improve our individual and collective attempts to live good human lives in challenging times by investigating and updating the debate in Ancient Greek philosophy about how to live a good human life. The project will directly benefit Australia by using ancient sources of wisdom to formulate cutting edge and rigorous responses to the ethical challenges facing the contemporary world, especially how to be a virtuous person in adverse circumstances (e.g., pandemics, natural disasters, economic downturns) and how to live together in communities that respect diversity and the natural world. The project will produce a graphic novel that dramatizes and makes accessible philosophical debates about virtue and the good life. The project’s impact will be facilitated through media and educational outreach and will contribute to Australia’s collective resilience by helping to develop ways to live ethically in challenging times.					

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FT220100711	**Gut-brain control of cue-induced feeding behaviours**	202,857.00	202,857.00	202,715.00	202,715.00	811,144.00
Ong, Dr Zhi Yi	This proposal aims to determine how food cues (e.g., advertisements) trigger our desire to eat. Using modern virally-mediated strategies, behavioural and histological techniques in a transgenic rat, this proposal seeks to characterise novel gut-brain circuits that mediate cue-induced feeding behaviours. This is significant as food cues can cause overeating, which is problematic in the current obesogenic society, yet the mechanisms are unclear. This project expects to provide new knowledge on how the gut communicates with multiple brain regions to control cue-induced eating. This work should benefit the advancement of knowledge and establish a framework for future research on gut-brain mechanisms in cue-induced feeding.					
	National Interest Test Statement					
	Food cues (e.g. advertisements) are powerful triggers of craving and eating. In our current society where there is an abundance of food cues, overeating is a key contributor to the development of obesity, which has a major societal impact, affecting 2/3 of Australian adults and 1/4 of children. Yet, we still do not know how to control overeating and the underlying mechanisms of cue-induced food-seeking behaviours are poorly understood. This proposal seeks to address this gap in knowledge by determining the gut-brain mechanisms underlying cue-induced feeding behaviours. This new knowledge can yield significant economic and social benefits to Australia.This research will enable the identification of more effective strategies to reduce overeating, which could be adopted by the pharmaceutical industry to aid the development of novel gut and brain drug targets to reduce food cravings. Further, novel behavioural interventions that reduce overeating by understanding and controlling the impact of cue-induced eating could be adopted and adapted to reduce the incidence of obesity in Australia.					
FT220100757	**Artificial Self-Replication of Peptide Nanocapsules**	211,687.00	205,248.00	205,248.00	212,638.00	834,821.00
Fahrenbach, Dr Albert C	Replication is key to the operation of biology, but how molecular replicators arose spontaneously on early Earth remains an open question. The ability of molecules to self-replicate must have come before the development of the highly evolved enzymes that biology currently employs. The aim of this Future Fellowship is to develop a peptide nanocapsule capable of replicating itself nonenzymatically by self-templated ligation, thus offering a platform that possesses the traits needed for Darwinian evolution to emerge. By obtaining a better understanding of the design and function of self-replicating systems, this project is expected to transform our understanding of some of the key chemical principles needed for life's emergence.					
	National Interest Test Statement					
	This project will address the question of how simple peptides, the building blocks of proteins, could have started replicating themselves on the early Earth, thereby leading to some of the first virus-like molecular systems. In so doing, the project will demonstrate how life-like behaviour can emerge from pure chemistry. This will furnish new insight into the origins of life as well as the physical organic chemistry of viral nanocapsules which can act as molecular delivery systems for RNA. This project will advance our understandings of the origins of life, one of the greatest unsolved mysteries of science. Addressing this question enhances Australia's reputation in complex, contemporary science. Understanding of the protein capsules of viruses may also lead to enhanced therapeutics which stand to benefit Australia socially and economically by enabling the rational design and manufacturing of future vaccines. This project will complement the outcomes of the >$100m RNA initiatives recently invested in Australia to mitigate the social and economic damage of future viral pandemics.					
	The University of New South Wales	3,252,640.00	3,294,718.00	3,283,950.00	3,238,048.00	13,069,356.00
The University of Newcastle						
FT220100073	**Young Workers and the Future of Service Employment**	245,000.00	240,000.00	235,000.00	220,000.00	940,000.00
Farrugia, Dr David	This project aims to understand how the social and political relations of service employment are transforming, and how workers' participation can support the future viability of the service economy. It explores how young service workers negotiate their status, conditions and working relationships, and how service employment facilitates or limits their social and political participation. This evidence base supports efforts to improve the resilience and productivity of the service economy and enhance the social relations of service labour at a time of economic crisis. It will benefit policymakers, employers and worker representatives aiming to engage and support this diverse labour force.					

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	National Interest Test Statement This project creates evidence to improve productivity and conditions in the post-COVID service economy by enhancing workplace relations to create workplaces that meet the expectations of workers and employers. Improving productivity and employment relations is a national priority, but the service economy is in an unprecedented and poorly understood period of transformation, as labour shortages and public concerns about wage and job insecurity inhibit the sector's recovery. To respond to these challenges, this project will examine the social relationships of service employment, explore the expectations and strategies workers use in negotiating conditions, and identify ways to strengthen productivity and job satisfaction. It will inform policymakers, employers and worker representatives aiming to engage and support this diverse labour force. Translation of findings will occur through the collaborative network of stakeholders including diverse worker representatives, industry bodies and policy makers to deliver tailored solutions to safeguard future viability of the service economy.					
FT220100330 Schunker, Dr Hannah	**Closing the Solar Cycle** This project aims to decisively settle the debate about the mechanism driving magnetic activity on the surface of the Sun. By drawing on extensive, big-data analysis of solar observations the project intends to use the technique of helioseismology to reveal differences in the statistical evolution of magnetic regions. Expected outcomes of this project will powerfully refine our models of the interaction between convective flows and magnetic fields in the Sun, resulting in a leap forward in solar dynamo theory, one of the fundamental problems in astrophysics. The anticipated benefits include moving from nowcasting to forecasting space weather, mitigating the billion dollar economic effects of geomagnetic storms.	200,000.00	200,000.00	200,000.00	200,000.00	800,000.00
	National Interest Test Statement This Fellowship is directly aligned with Australia's rapidly growing space physics industry and the national science priorities of "Advancing Space" in the Australian Civil Space Strategy (2019-2028). Space weather concerns the dynamics of the radiation and magnetic fields in interplanetary space, particularly near the Earth. Space weather, and solar storms, are driven by the Sun's magnetic field. Modern infrastructure, such as GPS, satellite communications, and power grids, face serious damage from solar storms, instigating subsequent economic impacts and breakdown of society. Australia will suffer particularly badly from any interference in communications or power supply, due to the isolation that comes from being an island continent, the large distances between populations, and the increased sharing of power grids across state lines. Given Australia's rapidly growing space industry and cybersecurity research priority, now is the time to invest understanding the Sun's magnetic field so that Australia can acquire sovereign capabilities in space weather forecasting.					
FT220100557 Gibb, Dr Zamira	**Improving the Sustainability of Australian Livestock Production Systems** The sustainability of livestock production systems must urgently be improved. This Future Fellowship builds upon Dr Zamira Gibb's portfolio of high-impact research to deliver extension and adoption activities which will improve the outcomes of cattle and horse selective breeding programs; allowing the dissemination of low-methane genetics to remote Northern Australian cattle breeding regions, reducing wastage of breeding horses and dairy cattle, and improving foal heath and offspring longevity. This project will address the environmental, ethical, and economic concerns which threaten the sustainability of these culturally significant livestock industries which are the cornerstone of everyday life in regional communities.	229,430.00	229,430.00	229,430.00	229,430.00	917,720.00
	National Interest Test Statement This project is focused on improving the sustainability and productivity of Australia's livestock breeding industries by bringing cutting-edge technologies and innovative management strategies from the laboratory to the farm. These include a simple device for on-farm sperm fertility prediction, feed supplements to improve fertility and offspring health, and a convenient method for storing semen for 7 times longer than current methods allow, thereby extending the viable time for transporting to farmers in remote locations. Altogether, this project will reduce environmental impact by facilitating access to sperm from bulls with key genetics for reduced methane emissions, increase economic return and food security by maximising the efficiency of breeding practices, and improve animal welfare by reducing the need for invasive veterinary procedures. Established partnerships with industry regulatory bodies such as Meat & Livestock Australia and Agrifutures Australia will ensure that this project's outputs are adopted by primary producers to effectively address key industry priorities.					
	The University of Newcastle	674,430.00	669,430.00	664,430.00	649,430.00	2,657,720.00

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The University of Sydney						
FT220100076	**The Monetisation of Children in the Digital Games Industry**	231,654.00	226,654.00	226,654.00	226,654.00	911,616.00
Carter, Dr Marcus	This project aims to understand the monetisation of children in the digital games industry. It will employ innovative studies of children's experiences in freemium games; parental attitudes and strategies; participatory research with game developers; and an examination of the platform and regulatory environment that shapes game monetisation. Expected outcomes include guidelines and recommendations for parents seeking to negotiate children's digital play; new ethical frameworks for the design and implementation of digital games for children; and actionable advice for policymakers and practitioners. This will bring significant benefits to Australian children, parents and game developers via improvements to the design of games for children.					
	National Interest Test Statement					
	81% of Australian children play digital games, and in 2020 they spent an estimated $740 million on games and gaming microtransactions. The growth of digital games is a source of enormous concern for parents, and games are coming under increasing public scrutiny for the use of gambling-like microtransactions such as 'Loot Boxes'. Understanding why children spend money in games, and when this spending becomes unhealthy or harmful, requires research beyond simplistic claims that games are 'addictive' to understand what digital play means to players. This project will create significant national benefit by designing and implementing innovative gaming studies aimed at children, parents, game developers, and the policy environment. Benefits include new ethical frameworks for the design and implementation of games for children, the development of guidelines and recommendations for parents seeking to negotiate children's digital play; and actionable regulatory advice for policymakers and practitioners. Insights from this research will be used to produce a video series as a public resource for children, parents and teachers to engage in healthy and constructive conversations about videogame spending.					
FT220100115	**Resonant histories of musical encounter in Australia**	204,029.00	247,330.00	247,984.00	257,919.00	957,262.00
Harris, Dr Amanda	This project aims to understand Australia's cultural past by situating histories of musical encounter in the nation's Oceanic location and colonial history. Underpinned by multi-sensory conceptual frameworks, it aims to apply collaborative, intercultural and interdisciplinary approaches drawing on historical, musicological and ethnographic methods to reveal musical encounters as sites for understanding Australian history. Focusing on a formational period, 1888-1988, the project expects to generate new knowledge about Australian musical institutions, sites and intercultural encounters and aims to have benefits for the diversification of curricula, and implications for Australian cultural policy.					
	National Interest Test Statement					
	Australia's current musical life is characterised by rich diversity. Australian musicians are known internationally as popular music stars, leading art music composers and performers, and distinctive Indigenous musicians. Participation in musical life is a major part of our $112 billion cultural sector. Despite this, music's persistent place in shaping our nation is not well understood. This project will reconceptualise Australia's diverse musical cultures in a history of intercultural encounters grounded in reciprocal exchange, shaped by place, and supported by new cultural institutions. It will generate new knowledge and understandings about the musical past that underpins our current vibrant culture which can inform cultural policy in a critical period of economic and cultural recovery for Australia's valuable creative industries. Creating a podcast series and online visualisations of Australia's musical networks, the project will broaden the curriculum resources available to tertiary and school students in understanding the history of music in Australia.					
FT220100125	**Categorical geometry and perfect group schemes**	222,042.00	228,654.00	230,652.00	213,652.00	895,000.00
Coulembier, Dr Kevin D	The aims of this project are to construct novel geometric theories based on newly discovered tensor categories, to apply the theories to solve open problems in representation theory, algebra and category theory, and to establish profitable new connections between the influential theories of affine group schemes and classifying spaces. The geometric theories will be developed in a universal way, generalising both classical algebraic geometry and super geometry from physics, and specialising to infinitely many new theories. This universality ensures a significantly broader basis for long term applications of geometry in many areas of science. Other benefits include enhanced international collaboration and scientific capacity in Australia.					

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	National Interest Test Statement This project aims to develop a framework to solve existing problems in areas of mathematics that enable and support the digital infrastructure on which we rely every day to keep us connected, informed and safe, and are also key to advancing next generation computing. Computer scientists and engineers will apply the new mathematical tools and formulas developed during this project to improve and advance a wide range of technologies that are essential to every Australian's work, education opportunities and social lives, such as accessing and protecting our personal data. This research will ensure Australia remains economically competitive in key technology sectors, increasing our capacity to train researchers in the leading mathematical methods needed to solve the technical problems of tomorrow's artificial intelligence, cyber security, and quantum computing industries.					
FT220100318 Liu, Dr Tongliang	**Modelling Adversarial Noise for Trustworthy Data Analytics** Adversarial robustness is a core property of trustworthy machine learning. This project aims to equip machines with the ability to model adversarial noise for defending adversarial attacks. The project expects to produce the next great step for artificial intelligence – the potential to robustly explore and exploit deceptive data. Expected outcomes of this project include theoretical foundations for modelling adversarial noise and the next generation of intelligent systems to accommodate data in a noisy and hostile environment. This should benefit science, society, and the economy nationally and internationally through the applications to trustworthily analyse their corresponding complex data.	192,210.00	197,210.00	197,210.00	177,904.00	764,534.00
	National Interest Test Statement Machine learning is a core part of artificial intelligence widely used in modern business, health and defence sectors. However, most machine learning algorithms possess a critical vulnerability to malicious attacks through imperceptible, but carefully designed shifts in the input known as 'adversarial noise'. This project aims to equip machines with the ability to model adversarial noise and defend themselves from attack. It will lay the theoretical foundations for the next generation of intelligent systems, providing excellent defence and practical algorithms to perform trustworthy data analytics for real-world applications in the era of big data. This enhanced cybersecurity capability can ensure the security of the critical systems that support Australia's financial, health, transport and defence industries. With AI estimated to generate $13 trillion in economic activity globally by 2030, and Australia's focus on translating AI innovation into practice, this research can significantly benefit our economy.					
FT220100359 Tan, Dr Ting Rei	**A Dual-species Ion Trap with Precision Optical Clocks** This project will enable new technological capabilities to overcome challenges in scaling up quantum computation and advancing quantum clocks. It will develop a versatile dual-species atomic instrumentation paired with precision laser systems. This advanced technological platform will be augmented by an extensive toolbox of quantum control engineering protocols to perform error-robust quantum operations for fault-tolerant quantum computation and high-precision spectroscopy. The expected outcomes will also benefit other disciplines: advanced quantum simulations for chemical dynamics, precision spectroscopy for astronomy, next-generation lasers, tests of fundamental physics, and quantum-enhanced positioning, navigation, and timing.	223,000.00	205,000.00	198,000.00	198,000.00	824,000.00
	National Interest Test Statement This project will build a new atom-based device to overcome challenges in building future quantum technologies, which are currently limited because they are too noisy and inaccurate. Engineers can use the advanced capabilities of this device to improve the performance of quantum computers and increase the accuracy of the world's best clocks. These developments will give Australia's defence industries a competitive advantage and may enable the Australian pharmaceutical, transport, and farming industries to deliver products and services more efficiently. For example, it may shorten drug and vaccine development times to rapidly respond to future pandemics and improve the accuracy of global satellite navigation systems. Conducting this research in collaboration with Australia's emerging quantum technologies sector will ensure it also provides a rich training ground where the quantum engineers of tomorrow will develop the skills to ensure Australian-based quantum industries remain globally competitive.					

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FT220100601	**Nano-engineering of hierarchical catalysts for renewable chemicals**	263,869.00	263,869.00	263,869.00	265,318.00	1,056,925.00
Huang, Prof Dr Jun	Producing high-value chemicals based on renewable alternatives -biomass resources is vital for the climate and a sustainable economy. This project will develop a unique nano-engineering approach to design hierarchical catalysts for the selective conversion of biomass into tailor-made products. Advanced in situ spectroscopic techniques will be employed to establish the structure-reactivity relationship of working catalysts and thereby manipulate the key factors governing the activity/selectivity. Such cutting-edge knowledge gained is crucial for optimising process efficiency and resource utilisation, which is essential for the success of the biorefining industry and a more environmentally-friendly chemical economy in Australia.					
	National Interest Test Statement					
	The chemical industry is the second largest industrial consumer of fossil fuels, which it transforms into the paints, tough and malleable plastics, pharmaceuticals and detergents we use every day. Producing high-value chemicals from renewable biomass resources is vital for both the Australian climate and a sustainable economy, but is currently costly. New chemical processes that efficiently convert compounds from plants, wood and waste are key to reducing costs. This research aims to solve the major technical and economic challenges to producing renewable chemicals. Bridging the gap between fundamental molecular-scale studies and realistic biorefining processes, it will develop highly efficient, cost-effective methods to convert Australia's abundant cheap biomass feedstocks into sought-after products used in the pharmaceutical, cosmetic, food, textile, vitamin and plastics industries. The technology will transform the biorefining industry in Australia, creating commercial opportunities in renewable chemicals as well as reducing our carbon footprint and greenhouse gas emissions.					
FT220100717	**Elucidating the molecular mechanisms of dual function transporter/channels**	286,093.00	286,093.00	286,093.00	286,093.00	1,144,372.00
Ryan, Prof Renae M	This project aims to understand how a membrane protein that transports chemical messengers in the brain functions and how it is influenced by the membrane in which it is embedded. Cells from all life forms have a lipid membrane that separates them from their external environment. These membranes contain proteins that control the movements of molecules into and out of cells and are vital for a plethora of physiological processes including cell-to-cell communication. The outcomes of this study will include new knowledge of this process and chemical modifiers of this transport protein. This project will benefit structural biology and biophysics training and may lead to the development of novel compounds that can be used to explore function.					
	National Interest Test Statement					
	Cells from all life forms have a barrier membrane containing nanoscale machines that control what moves in and out of cells, but we don't know what they look like or how they work. These machines are vital for many processes including how cells talk to each other in the brain, and how cells absorb nutrients. Disrupted cellular communication can lead to diseases such as epilepsy, while cancer cells use these machines to scavenge nutrients to fuel their rapid growth. This project will generate new knowledge of how these nanoscale machines work that will ultimately help Australian researchers and our pharmaceutical industry better understand the mechanisms of cellular communication and design new drugs to treat epilepsy and cancer. This project will provide training in the use of cutting-edge infrastructure and innovative scientific techniques that are needed for jobs in drug discovery across Australia's higher education and pharmaceutical sectors.					
	The University of Sydney	1,622,897.00	1,654,810.00	1,650,462.00	1,625,540.00	6,553,709.00
University of Technology Sydney						
FT220100018	**Super-Resolution Nanothermometry on Live Cells**	236,954.00	244,954.00	241,154.00	241,154.00	964,216.00
Zhou, Dr Jiajia	This project aims to deliver new temperature sensors and advance the field of nanothermometry beyond its optical diffraction limit and current reliability issues. The project expects to forge a new way to study organelle metabolism and functional interactions by creating a super-resolution heat map of living cells. Expected outcomes include new knowledge of ionic energy transfer among lanthanide ions, innovative super-resolution imaging nanothermometers, new biochemistry and cell biology protocols, and spectroscopy and microscopy instruments. The adoption of these outcomes in new technologies should provide significant benefits in cell biology research, life sciences, engineering sciences and Australia's imaging and sensor industries.					

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	National Interest Test Statement The accurate measurement of temperatures inside living cells allows important insights into the internal cell structures, functions and health. Such measurements require highly specialised sensors based on nanotechnology, but current techniques lack accuracy, reliability and spatial resolution. This project will deliver new temperature sensors with advanced spatial resolution, better accuracy and superior reliability, allowing the creation of completely new analysis techniques, such as a super-resolution heat map of living cells. It is expected that the adoption of the new techniques by the Australian biotechnology and advanced manufacturing industry will revolutionise the development of next- generation diagnostics devices. The devices will assist medical specialists in the early diagnosis and effective treatment of a diverse range of diseases, such as neurodegenerative disorders, cancer and cardiovascular diseases. Ultimately, this project's research has the potential to benefit the Australian public through better health outcomes and to improve the competitiveness of Australia's biotechnology industry.					
FT220100053 Aharonovich, Prof Igor	**Quantum Nanophotonics with Atomically Thin Materials** This project aims to deliver new hardware for scalable integrated quantum photonics based on fluorescent defects in hexagonal boron nitride. The project will generate new knowledge in advanced manufacturing of two-dimensional systems, to pivot towards engineering of new optical qubits. Expected outcomes include a solid-state platform for on-chip quantum technologies and development of sovereign quantum capabilities. The results will constitute an important step towards implementation of secure communications and quantum information protocols. Benefits include advances in emerging manufacturing capabilities, training of young Australians, generation of intellectual property and securing major economic benefits to all Australians.	292,243.00	280,000.00	280,000.00	266,000.00	1,118,243.00
	National Interest Test Statement Quantum technologies are poised to revolutionise the way we conceive and use technology in our daily lives. However, such technologies rely on development of new quantum hardware based on materials with extremely thin atomic layers. This project will generate significant, fundamental and practical knowledge about these new materials, and develop pathways to engineer them into real-world devices. Quantum technology products, such as quantum processing chips, will enable indispensable applications for a sovereign Australia – including secured communications, cryptography, high-speed computing and advanced sensing. Research translation through intellectual property licencing, especially to future Australian start-up companies, will allow the project's research discoveries to be commercialised and made widely available. The spectrum of end users may include defence, banking and cybersecurity sectors, as well as agriculture and space. Future quantum technologies will be critical to ensure Australia's continued, economic prosperity, and its leadership in the global quantum industry.					
FT220100177 Li, Dr Wengui	**Robust cement-based sensors for smart automation in future infrastructure** Infrastructural health and operation monitoring are core parts of managing built assets. The project aims to develop robust cement-based sensors with integrated self-sensing and hydrophobicity, and to optimise their robustness and resilience for smart automation in future infrastructure. The new sensors are expected to more accurately assess structural health, monitor traffic-flow, decrease the costs of operation and maintenance through enhanced piezoresistivity and serviceability, and gain insights into intrinsic self-sensing and integral water repellency. The outcomes will improve predictions of performance and service, with major reductions in asset management costs through significantly more-efficient operation and maintenance.	231,554.00	243,194.00	239,994.00	204,842.00	919,584.00
	National Interest Test Statement Service loads and severe environments lead to premature deterioration and ageing of concrete infrastructure. This project will develop a new class of highly durable cement-based sensors, that can intrinsically sense deformation, cracking, and damage in concrete, thus enabling precise monitoring of structural health and traffic flow. The outcomes will address the urgent need for a new generation of robust sensors for structural monitoring to improve the compatibility, efficiency, durability, and serviceability of Australia's existing and future infrastructure. Specifically, this will enable reliable planning of maintenance and life-cycle management strategies. Predicting early degradation will significantly reduce remediation and replacement costs; safeguard life, property, and asset values; and extend the service life of our expensive public infrastructure. These advances and benefits will create commercialisation opportunities, provide strong economic incentives for Australia's construction and maintenance industries, and generate jobs in advanced onshore monitoring sensor manufacturing.					

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(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
FT220100391	**Learning Software Security Analysers with Imperfect Data**	226,654.00	226,654.00	226,654.00	212,348.00	892,310.00
Sui, Dr Yulei	This project aims to systematically investigate next-generation learning-based software security analysis to detect vulnerabilities in real-world large-scale software. The expected learning-based foundation will support the handling of imperfect data in order to provide a precise, scalable and adaptive security analysis of the critical software components, thus capturing important security vulnerabilities missed by existing approaches. The success of this project will further enhance the international competitiveness of Australian research in this important field and will benefit any Australian industry and business where software systems are deeply-rooted, such as transportation, smart homes, medical devices, defence and finance.					
	National Interest Test Statement					
	Modern society relies heavily on reliable and secure computer systems. Software security vulnerability can cause critical system failures, resulting in social and economic impacts and costing the Australian economy $29b per year (Chalmers,2019, Address to NAB National Cyber Security Summit). This project supports the Government's national Cybersecurity research priority by developing a next-generation machine-learning-based security analysis framework to detect critical software vulnerabilities missed by existing approaches. Expected research outputs include an open-source tool which can be used and adopted readily by data scientists, software and cybersecurity professionals. The outcomes of this project will create new knowledge, commercialisation opportunities, foster Australia's cybersecurity leadership and increase the resilience of critical infrastructure. Outcomes will directly benefit Australia's industries such as ICT, transport, defence, finance, space and communication. Further, the project's high-quality training opportunities will enhance Australia's research capacity in cybersecurity and AI.					
FT220100561	**Developing lithium metal batteries – a game-changer for renewable energy**	200,210.00	213,510.00	213,510.00	199,510.00	826,740.00
Sun, Dr Bing	This project aims to develop nanostructured lithium metal anodes for rechargeable lithium metal batteries with high energy density and excellent cycle life. Lithium metal batteries such as lithium-sulfur batteries and lithium carbon-dioxide batteries present great opportunities for long-range electric vehicles and high-efficient renewable energy storage. Through the rational structure design and advanced interface engineering, the developed lithium metal anodes are expected to overcome the critical issues that hindered their practical application for high-energy batteries. The success of this project will provide new technological solutions for next-generation energy storage devices.					
	National Interest Test Statement					
	It is well recognized that energy generated from renewable sources instead of burning fossil fuels reduces greenhouse gas emissions. Developing reliable energy storage systems plays an essential role in boosting renewable energy utilisation. Lithium-based rechargeable batteries are widely considered as a dominant system for energy storage. This Future Fellowship project is expected to deliver breakthrough cutting-edge nanotechnologies that enable lithium metal batteries to double or even triple the energy density of the current commercial lithium-ion batteries. The outcomes will generate new knowledge in materials science and nanofabrication and promote the upgrade of the battery industry. This project will assist Australian government's investment in the new battery-related industries that will create job opportunities, accelerate clean energy utilisation, and secure a net-zero carbon future.					
FT220100610	**Engaging the forgotten public health workforce**	228,309.00	228,231.00	228,229.00	228,310.00	913,079.00
Steel, Dr Amie	This Fellowship project aims to provide the first in-depth, coordinated, critical public health examination and application of consumer behaviour-informed methodology to examine health promotion and complementary medicine. The project aims to build on novel analyses and critical engagement with community members, health professionals and policymakers to advance public health scholarship of health information-seeking and chronic illness prevention. It seeks to identify challenges and opportunities to improve Australian health promotion initiatives; provide an evidence-base to inform coordinated implementation of the National Preventive Health Strategy; and optimise the primary care workforce to benefit health promotion for Australians.					

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	National Interest Test Statement More than one third of Australia's burden of disease is due to preventable illness. This year the federal government has released its landmark National Preventive Health Strategy to promote positive health choices and improve Australians' health and wellbeing. The Strategy's success relies on coordinated multisectoral activities across all settings and channels. However, complementary medicine (CM) practitioners constitute half of the primary health care workforce and actively share health information with the public and their patients yet are largely forgotten in health policy, strategy and planning. This Fellowship develops the evidence required to ensure the health promotion activities of CM practitioners align with wider government priorities and are coordinated with government health promotion initiatives. It provides a roadmap for the government to reach millions of Australians seeking health information from non-government sources or visiting a CM practitioner for health advice. Thus, it addresses a neglected yet fundamental component of preventive health strategy impacting public health outcomes.					
	University of Technology Sydney	1,415,924.00	1,436,543.00	1,429,541.00	1,352,164.00	5,634,172.00
University of Wollongong						
FT220100046 Guo, Dr Fuchun	**Provably Secure Cryptography Techniques: Effective, Elegant, and Economic** This project aims to contribute to advanced knowledge and techniques to remove relaxed proof factors from provable security. Cryptography nowadays can be proven secure and must be provably secure before being adopted for data protection. Until today, most cryptography schemes are still using some relaxed proof factors to prove security, but using these relaxed factors was risky. The expected outcomes are proof methodologies for researchers to prove security in an easy way (effective), cryptography techniques for proving security without any relaxed proof factors for cryptography schemes (elegant), and more practical cryptography schemes with elegant proofs to enable Australians to receive benefit from secure data protection (economic).	226,654.00	233,539.00	226,654.00	198,042.00	884,889.00
	National Interest Test Statement The Australian Government has identified the A$5.6 billion cyber security sector as crucial for Australia's future growth and prosperity. This project will produce new cryptography technologies and approaches to secure software applications, mobile devices, cloud computing and critical infrastructure. The outcomes will also support the nation's cyber security in terms of resilience and effective responses to cyber intrusions and attacks. The project will prevent adoption of insecure algorithms that cause substantial economic loss and will contribute to safer and more practical algorithms that reduce protection costs essential for the provision of secure data and data services. The project will support the digital economy and a burgeoning ecosystem of 350 cyber security providers in Australia, securing exports and the employment of over 26,500 workers. It will also enable sovereign cyber security capacity critical to Australia's security in a rapidly changing world.					
FT220100178 Charlton, Prof Karen E	**Creating a sustainable, healthy, and equitable food system** This project aims to develop a whole-of-food system approach that will result in a more healthy, sustainable, and equitable food environment. A multi-disciplinary approach, based on the US Vermont Farm to Plate initiative, will bring together key stakeholders to collectively increase availability and access to locally sourced food, increase consumer awareness of sustainable food choices, accompanied with a retail "Love Local" campaign. Knowledge created by this research will inform policy and legislative reforms that will empower local governments and communities to respond to food system challenges. This case study in regional NSW will demonstrate the effectiveness of a framework that can be upscaled to other areas and countries.	244,307.00	272,593.00	278,614.00	271,426.00	1,066,940.00
	National Interest Test Statement Urgent action is needed to reduce the environmental impact of the food system in Australia. Current food production methods and dietary patterns are unsustainable in ensuring supply and supporting human and planetary health. What is needed is a more local approach to food systems and livelihoods. This project aims to develop a "paddock-to-plate" food strategy in regional NSW that can be upscaled to other areas. We will work with key stakeholders (growers, agribusiness, food retail, Indigenous land affairs, civil society organisations, local governments) to co-design solutions that can be adopted through online farmers markets, a Love Local food initiative, and transformation of local university campus food environments. Effectiveness of the strategy will be measured through consumer surveys to assess the environmental footprint of food choices, and economic analyses. National benefit of the research is increased capacity to address environmental challenges in food production and food consumption practices.					

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FT220100368	**Monge-Ampere type equations and their applications**	237,854.00	237,245.00	237,276.00	221,261.00	933,636.00
Liu, Dr Jiakun	The study of Monge-Ampere equations has attracted major attention in mathematics in recent years, due to many significant applications in geometry, physics and applied science. This project aims to resolve challenging problems involving Monge-Ampere type equations, by utilising new ideas and breakthroughs made by the proposer. A comprehensive regularity theory for Monge-Ampere type equations, particularly in the degenerate case, is expected to be established. Innovative cutting-edge techniques and interdisciplinary approaches are expected to be developed. Anticipated outcomes of this project include the resolution of outstanding open problems and continuing enhancement of Australian leadership and expertise in a major area of mathematics.					
	National Interest Test Statement					
	Consider the task of earth moving in a building site: filling some holes, excavating others, and moving and shaping piles of dirt into desired forms. How do you do this with minimal fuel usage, allowing for the fact that your excavator is not accurate to the nearest sand-grain? This physical problem is hard, but at least visible. The same mathematical problem, called “optimal transport” arises, for example, in image processing in artificial intelligence, where the “dirt” is light intensities and colours in a computer image and must be described using more than three dimensions. This project will tackle such mathematical problems, leading to new image recognition techniques that can be practically applied to develop safer autonomous vehicles, robotics and more powerful security systems. Working with engineers and computer scientists, this project will develop optimal algorithms that enable such innovations. This will place Australia at the forefront of the global artificial-intelligence and robotics development race, which is essential to our sovereign capability in security and defence.					
FT220100857	**Generating evidence for nature-based strategies to reduce loneliness**	262,481.00	262,481.00	262,481.00	262,481.00	1,049,924.00
Astell-Burt, Prof Thomas	While loneliness and despair are reportedly increasing due to social and economic upheaval caused by the COVID-19 pandemic, governments are investing in urban greening. This project aims to help steer greening strategies to reduce loneliness and despair, to enable recoveries from COVID-19 that are more sustainable, equitable and nourishing. This project will: (1) engage with leading scientists within and outside Australia to formalise my draft conceptual model of pathways linking urban greening with loneliness and despair; (2) test associations and pathways with multiple sources of nationally representative data; (3) supervise a mixed-methods PhD project; and (4) share findings for building up knowledge capacities and guideline development.					
	National Interest Test Statement					
	Profound and potentially long-term social and economic upheaval caused by the COVID-19 pandemic has resulted in rising reported levels of loneliness. 1 in 4 Australians already felt lonely before COVID and protracted socioeconomic disruption involving lockdowns, economic inactivity, and mandatory working-from-home since mid-2020 have made this problem worse, as already recognised in jurisdictions such as the UK. This project will generate robust evidence and guidelines on how green spaces might be adapted to reduce loneliness and will provide options for local councils to plan for enabling more connected communities. The project will work with key change-makers including the NSW Government, and Parks and Leisure Australia to create insights into how current urban greening initiatives (e.g., park regeneration) can be enhanced to support population-wide solutions to loneliness in Australia. The project is of major importance as loneliness decreases social and economic participation and increases risks of various health issues including depression, diabetes and dementia for up to 6.4 million Australians.					
	University of Wollongong	971,296.00	1,005,858.00	1,005,025.00	953,210.00	3,935,389.00

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Western Sydney University						
FT220100017	**Het-Crete: High-Grade Chemical-Treated Heterogeneous Recycled Concrete**	277,481.00	277,481.00	277,481.00	277,481.00	1,109,924.00
Tam, Prof Vivian W	Of over 20 million tons of mixed construction and demolition waste generated annually, only 5% is recycled and less than 1% is adopted for low-grade construction activities. This innovative research aims to solve Australia's mixed construction and demolition waste disposal problem and lower its greenhouse-gas emissions at the same time. The research develops Het-Gregate with novel chemical admixtures and greenhouse-gas emissions to create Het-Crete, with new mixing techniques for its an optimal performance high-grade concrete. Life-cycle analyses will be conducted to generate Het-Crete specifications for the industry. This will significantly elevate Australia's world standing in recycled concrete research.					
	National Interest Test Statement This project will create Het-Crete, the world's first building material for high-grade construction applications using mixed construction and demolition waste combined with novel environment-friendly chemical admixtures and greenhouse-gas emissions. By employing novel automation modelling, Het-Crete recycled concrete will be shown to match the quality of virgin concrete, offering Australian construction industry a cost-benefit alternative building material for structural applications. This proposal will elevate Australia's world standing in recycled-concrete research and reveal the full potential of recycled concrete. Benefits for Australia include: (i) lowering its greenhouse-gas emissions by efficiently re-using abundant CO2 emissions; (ii) reducing Australia's landfills by reusing mixed construction and demolition waste; and (iii) raising environment awareness among Australian construction professionals and the public by effectively and efficiently deploying building waste. The new material, Het-Crete, will be the first of its kind and will help to ensure that Australia meets its net-zero target by 2025.					
	Western Sydney University	277,481.00	277,481.00	277,481.00	277,481.00	1,109,924.00
	New South Wales	9,288,641.00	9,398,704.00	9,390,350.00	9,159,562.00	37,237,257.00

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Queensland						
Queensland University of Technology						
FT220100106	**New-generation flexible thermoelectrics for wearable electronics**	235,881.00	277,493.00	277,493.00	275,493.00	1,066,360.00
Chen, Prof Zhi-Gang	This project aims to develop lightweight, flexible, and durable thermoelectric thin films for wearable electronics using a computation-guided approach, coupled with novel device design and materials nanoengineering strategies. The key breakthrough will overcome the stereotype of fragile thermoelectric materials and their low thermoelectric efficiency for achieving localised, instant, and controllable power generation and/or cooling with record-high performance in carefully designed wearable thermoelectric devices. Expected outcomes include new understanding of thermoelectrics and innovative technologies for achieving electronics/energy applications, which will provide significant economic and educational benefits for Australia.					
	National Interest Test Statement					
	Australia is highly reliant on fossil fuels for energy supply, which leads to critical environmental issues such as air pollution, increasing greenhouse gas levels, and subsequent climate change. To overcome these challenges, this project aims to develop emission-free and maintenance-free power supply with high energy conversion efficiency by using wearable thermoelectric materials and devices which are flexible and can directly transfer heat from the environment or body heat into energy-autonomous electricity. The new knowledge and technologies developed in this project will bring significant economic and commercial benefit to a number of Australian industries, including electronics, mining, and energy, by increasing international recognition for Australia, generating new markets, and creating new employment opportunities. Application of the project's technologies will significantly decrease the usage of fossil fuels, lowering greenhouse gas emission and environment pollution, ensuring solid environmental and social benefits to the Australian community.					
FT220100732	**Plasmonic nanoparticle catalysis for nitrogen-based synthesis**	230,000.00	230,000.00	230,000.00	230,000.00	920,000.00
Sarina, Dr Sarina	Light can generate an optical force to capture small objects. This requires intense light – a laser, which limits optical trapping in catalysis applications. This project aims to apply plasmonic nanoparticles with normal-intensity light to take advantage of plasmonic-generated optical forces for catalytic chemical synthesis. The optical trapping/releasing of small molecules is highly selective and responsive to molecule structure and so presents a great opportunity to radically alter chemical synthesis pathways, which will be illustrated with reactions on liquid-solid and gas-solid interfaces. This highly innovative strategy will be used to discover new nitrogen-based syntheses which are both fundamentally and industrially important.					
	National Interest Test Statement					
	Chemical manufacturing is a major energy consumer, typically relying on non-renewable sources like coal, petroleum and natural gas, which release carbon dioxide into the atmosphere when burnt, causing environmental pollution and contributing to climate change. This project aims to develop a cleaner process for chemical manufacturing, enabling lower-energy production of ammonia, a chemical used in fertilizer for about 50% of the world's food production. The expected outcome is an innovative, environmentally friendly technology for preparing nitrogen-containing products such as ammonia by utilising abundant Australian sunlight, rather than non-renewable fuels, as the energy source. This cutting-edge process could replace hazardous, expensive, energy-hungry production methods, often requiring high temperatures and pressures, to make nitrogen-containing products in a safer, environmentally friendly, clean, sustainable manner. This work is a critical piece in Australia's journey toward increased onshore manufacturing and will lead to significant economic, commercial and environmental benefits for Australia.					

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FT220100756	**Preventing child sexual abuse by understanding perpetrators' motivations**	256,000.00	250,000.00	244,000.00	280,000.00	1,030,000.00
Richards, A/Prof Kelly M	This project aims to investigate, for the first time, the experiential motivations of child sexual abuse perpetrators. Using a novel theoretical and methodological approach, it expects to discover new knowledge about the motivations of child sexual abuse perpetrators. Expected outcomes include new theoretical explanations for child sexual abuse perpetration and transformed policy and practice measures to prevent and respond to child sexual abuse in Australia and beyond. This should provide significant benefits, such as reduction of the widespread, severe and costly impacts of child sexual abuse, and an evidence base to support and enhance government initiatives such as the National Strategy to Prevent and Respond to Child Sexual Abuse.					
	National Interest Test Statement Child sexual abuse (CSA) affects nearly all Australians in some way. 27% of girls and 12% of boys directly experience some form of CSA. CSA has severe impacts for victims and immense social impacts, including homelessness, substance abuse and suicide. It costs Australians $2 billion p/a. Preventing CSA is thus an urgent priority for state and federal governments. We need to understand why adults perpetrate CSA in order to prevent it. This project aims to develop new knowledge about perpetrator motivations so we can understand, prevent and respond to CSA more effectively. The new knowledge produced will inform the development of more effective policies, practices and programs to prevent CSA in Australia. The project will contribute to minimising the widespread and severe impacts and vast economic costs of CSA in Australia. It will produce evidence to support and enhance key Commonwealth and state government initiatives, such as the National Strategy to Prevent and Respond to CSA.					
	Queensland University of Technology	721,881.00	757,493.00	751,493.00	785,493.00	3,016,360.00
The University of Queensland						
FT220100069	**Statistical Methods for Next Generation Genome-Wide Association Studies**	233,212.00	233,212.00	233,212.00	205,207.00	904,843.00
Yengo, Dr Loic	This project aims to develop cutting-edge statistical methods to analyse large genomic datasets and identify genetic variants associated with inter-individual differences in various human traits. Knowledge of trait-associated DNA variants is instrumental in understanding how natural selection has shaped human traits. By integrating genomic data from diverse and underrepresented populations, this project further expects to contribute to the equitable use of genomic technologies in humans, regardless of geographical origins. Expected outcomes of this research include novel analysis methods and software tools, which should broadly and significantly benefit gene discovery in other species, including those of agricultural relevance.					
	National Interest Test Statement Our genes affect how we look, age and behave. Yet, how important their role is and what specific traits they influence remains largely unknown. This project addresses these fundamental questions and aims to identify genes causing differences between individuals. The project will generate user-friendly computer programs which will be made publicly available for use in a wide range of contexts. For example, Australian farmers could use them to predict which plants or animals will have the greatest yield and chance of survival. This would advance the national priority of enhancing food production and significantly benefit Australia's economy as Agriculture accounts for 11% of Australia's goods and services trade. Forensics could also use these tools to improve the accuracy of DNA-based profiling, which will accelerate investigations and thereby increase safety for all Australians. Finally, by focusing on under-represented communities, this project will contribute to an equitable use of genomic technologies for all populations, thereby positioning Australia at the forefront of international genomic research.					
FT220100103	**Novel devices for spatial light transformation**	235,042.00	235,042.00	235,042.00	235,042.00	940,168.00
Carpenter, Dr Joel A	The aim of this project is to develop new optical instrumentation for spatially transforming light. This research expects to find solutions to problems that have thus far been out of reach by replacing what would traditionally be a human optical systems designer with computer algorithms. The expected outcomes include the development of three new devices as well as a set of design, fabrication and characterisation procedures that offer higher performance, increased robustness and scalability. This should improve accessibility of this technology and provide benefits to a wide range of applications, including astronomical and biomedical imaging, telecommunications, as well as quantum and classical optical signal processing.					

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	National Interest Test Statement The manipulation of light using optical systems (a combination of lenses, mirrors, and other elements) is used for astronomy, medical imaging, lasers, and many other applications. Existing optical systems designed by humans are limited by human intuition. This project uses computer algorithms without such limits to develop optical systems which have not previously existed, to implement new functionality and higher performance. The developed systems will strengthen Australia's lucrative optics industry (outputs of ~$4.3b/year) by opening new avenues for academic and commercial use in Australia, particularly for applications requiring precision control and measurement of light, such as telecommunications, astronomy, and advanced manufacturing. This project would enhance skill development and production method efficiency for several established and upcoming Australian businesses in the areas mentioned above and contribute to the development of new technologies with longer term employment and export benefits. Adoption would occur through both open science and collaboration with local and international partners.					
FT220100186 Gartner, A/Prof Coral E	**Transforming tobacco policy to deliver societal benefits** This project aims to develop new regulatory options for tobacco to minimise the legal market while avoiding the adverse societal and economic impacts of transferring consumer demand to illegal tobacco products. It addresses a significant current concern about a growing illegal tobacco market and seeks to improve understanding of the impact of tobacco control policies on the illegal market, and the societal impacts. The project also seeks to draw insights from illicit drug policy to understand potential consequences of greater restrictions on the legal tobacco market. The expected outcomes include an enhanced monitoring system for illicit tobacco and policy recommendations to achieve government goals of reducing smoking rates.	292,481.00	262,481.00	262,481.00	262,481.00	1,079,924.00
	National Interest Test Statement Reducing tobacco smoking will increase economic productivity, reduce the environmental impacts of the tobacco industry and improve community health and wellbeing. However, policy makers are faced with the challenge of developing public policy that balances restrictions on the licit tobacco market and potential growth of the illicit market. The societal harms of the illicit tobacco market include funding organised crime, impacts on individuals through contact with criminal networks while buying illicit tobacco, weakening public regard for the rule of law, and lost government revenue from foregone tax. The research will improve our understanding of how tobacco control policies, including greater restrictions on how tobacco can be supplied and the types of products available, impacts consumer demand for illicit tobacco products. It will also improve our ability to monitor illicit tobacco use in Australia. This project seeks to develop practical policy options to reduce tobacco smoking while minimising growth in the illicit tobacco market.					
FT220100350 Hickey, A/Prof Lee T	**Improving crops from the ground up: genetic solutions to optimise roots** This project aims to develop future crops with optimised root systems by overcoming genetic constraints that currently restrict their potential. Exploiting advances in genomics, transcriptomics, epigenomics and genome editing, this project expects to advance understanding of the biology and genetic controls of root development and responses to concurrent stressors, including drought, nutrient deficiency and soil-borne disease. It is anticipated that project outcomes will support the development of crops equipped with novel root traits, enhancing resource-use efficiency and yield stability amid climate variability. This globally relevant research is designed to benefit the sustainability and profitability of the Australian grains industry.	272,481.00	277,093.00	279,093.00	279,093.00	1,107,760.00
	National Interest Test Statement The Australian wheat industry – valued at $4.9 billion per annum – is renowned globally for producing high-quality grain for the production of breads, noodles and pastas. Most of the grain is exported, contributing 10–15% of annual international wheat trade and providing an important contribution to global food security. However, wheat production in Australia is vulnerable to drought and requires high fertiliser inputs due to nutrient-poor soils. While plant breeding has optimised above-ground traits to improve productivity under harsh Australian conditions, selection for below-ground traits has been minimal. This project aims to deliver new wheat lines with enhanced root traits to improve water and nutrient uptake for more sustainable and profitable farming systems into the future. New genetics created in this project are expected to improve wheat productivity over the next 10 to 20 years and could lead to a more stable supply of high-quality grain for domestic and export markets. Knowledge gained in this project should be transferrable to other important cereal crops, such as barley and oats.					

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FT220100485	**Molecular basis of glutamate receptor trafficking in neuronal plasticity**	239,842.00	240,542.00	238,842.00	240,542.00	959,768.00
Anggono, Dr Victor	Neurons communicate via synapses, where chemicals (such as glutamate) are released to transmit neuronal signals. This proposal is aimed at understanding the molecular mechanisms of neuronal communication and adaptive plasticity, which are essential for normal brain function. The proposed research will combine biophysical, biochemical, molecular and cell biological assays to elucidate how the trafficking of glutamate receptors is regulated in neurons during plasticity and learning. The outcomes will enhance our understanding of how neural plasticity is generated and maintained, knowledge that is critical for our understanding of the cellular correlates of information, sensory and motor processing, as well as learning, memory and cognition.					
	National Interest Test Statement					
	Learning is essential for survival; however, we still do not fully understand the processes the brain uses to learn, including storing and retrieving information. This project aims to investigate these processes in more detail. The findings of this research can then be used to enhance learning. This is of major relevance to Australia's national interest because learning influences most aspects of our lives. For example, improving learning could lead to improved educational outcomes, thereby increasing participation in the workforce and ultimately improving Australia's economic productivity. Translation of these discoveries into practice could occur through partnering with the pharmaceutical industry to create new products to enhance learning; or with engineers to advance artificial intelligence based on the human brain.					
FT220100487	**New Frontiers in Innate Immunity**	283,981.00	283,981.00	283,981.00	275,981.00	1,127,924.00
Blumenthal, Prof Antje	This program aims to define how the immune system senses and responds to environmental cues. By combining interdisciplinary approaches with cutting-edge imaging and spatial biology technologies, this program expects to reveal how immune sensor proteins are regulated at the molecular, cellular and tissue level. Outcomes of this program include unparalleled insights into molecular mechanisms that underpin effective functioning of the immune system, training of future scientists, and strengthening international collaborations across academia and industry. This will contribute to a high-quality workforce for research and innovation, and secure Australia's position at the forefront of immunology research driven by cutting-edge technologies.					
	National Interest Test Statement					
	The immune system is vital for the survival of animals and humans. One significant function of the immune system is to detect and respond appropriately to bacteria. The immune system allows "good" bacteria, that help maintain good health, to live in our gut and lungs. However, other bacteria that might cause infections need to be eliminated. There are significant gaps in our understanding of how the immune system detects bacteria. This research will provide new knowledge about how and where in the body bacteria are detected, and how these immune processes are regulated. Understanding these immune detection mechanisms could lead to future development of new drugs and vaccines that enable both humans and animals to stay healthy. Therefore, this research has the potential for social and economic benefits for Australia such as growing our pharmaceutical industry, protecting our valuable meat and livestock industry, and allowing us to lead healthy lives.					
FT220100583	**Peptides and Proteins for Fighting Pests and Protecting the Environment**	210,000.00	210,000.00	210,000.00	210,000.00	840,000.00
Wang, Dr Conan K	This project aims to use peptides and proteins to fight pests and protect the environment, which is significant because current practices have unintended harmful effects and are unsustainable. Achieving these aims must first involve scientific development of ecofriendly lead molecules. This project will develop platform technologies for the design of bioactive peptides or proteins based on molecules used naturally for highly selective functions in communication and defence. Expected outcomes include novel peptide and protein leads and improved strategies for developing them, which will lead to new and safer ways of protecting biodiversity and food security that are expected to reduce our environmental footprint and bring economic benefits.					

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(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
	National Interest Test Statement Australia's environment is a vital resource, the tourism and agricultural industries account for 6% of national Gross Domestic Product. Our environment is vulnerable to outbreaks of pests, and current control methods have unintended harmful effects. This project aims to develop selective pest control molecules for: (i) crown of thorns starfish, which causes destruction of the Great Barrier Reef, a national asset worth $56 billion; (ii) fall army worm, which destroys crops including barley (Australia is the world's 3rd largest producer); and (iii) pathogens that threaten food security. The molecules will be used to remove target pests from valuable Australian resources. E.g. eliminate fall army worm from Australian crops without harming beneficial pollinators, sustainably improving crop yield. They will be brought to market through existing and new partnerships with industry to validate activity in the field. Project outcomes address national research priority areas of food and environmental security.					
FT220100666 Knibbe, Dr Ruth	**Understanding dynamic interfaces in electrochemical systems** This project aims to develop nanoscale characterisation methods to understand dynamic processes in zinc-ion batteries and high temperature electrolysis systems under real working (in operando) conditions. This project expects to reveal critical solid-liquid and solid-gas interfacial processes in these two distinctly different electrochemical systems. The expected outcomes include improved understanding of electrochemical interfaces and improved tools and methods to observe nanoscale interfacial processes. This information can be used to underpin mechanistic models, which will facilitate new materials design.	235,000.00	235,000.00	235,000.00	235,000.00	940,000.00
	National Interest Test Statement Electrochemical reactions are chemical processes that produce or consume electricity and are essential for battery operation. These reactions are not well understood, because they occur at the nanoscale (one billionth of a meter) and are difficult to view. When these reactions are poorly designed, they use a large amount of electricity and as such are very expensive to operate. The aim of this project is to develop new methods to use with powerful microscopes to give us a deeper understanding of electrochemical reactions. This is important because it will allow us to design new materials to improve efficiency and reduce the cost of various electrochemical reactions. The knowledge gained will have a wide range of applications which Australia will be able to manufacture. For example, rechargeable zinc-ion batteries which can be used in safe and flexible devices such as wearable heart monitors. As Australia holds the world's largest zinc reserves, we are well-positioned to be a global leader in this market.					
FT220100713 Mercer, A/Prof Timothy R	**Synthetic genes as reference standards for biology and biomanufacture.** Reference standards are needed to improve the measurement of biology and the reliability of biomanufacturing processes. This project aims to engineer synthetic genes capable of acting as reference standards for DNA, RNA and protein. The synthetic genes can be transcribed into mRNA standards, and translated into protein standards, and be further integrated into living cells to measure internal cellular processes. The outcomes include a unified understanding of gene expression and more accurate next-generation sequencing and mass-spectrophotometry technologies. The synthetic genes also allow standardisation and optimisation of biomanufacturing processes that will produce mRNA and biologics products at a higher purity and lower cost.	267,453.00	275,053.00	276,293.00	265,187.00	1,083,986.00
	National Interest Test Statement mRNA technologies are widely recognised as a key technology that will drive future advances in health, industry and agriculture. As a central part of our Modern Manufacturing Strategy, the Australian Government has prioritised the development of onshore mRNA biomanufacturing capabilities that are needed to prepare for future pandemics, and support the development of mRNA technologies by national researchers. The research described herein will develop the first reference controls standards needed to establish best-practice mRNA manufacture capabilities. These synthetic gene standards will enable optimisation of manufacturing processes, enable coordination across a global network of manufacturing facilities, and foster the development of new innovative mRNA technologies. This international adoption of synthetic genes as industry standards will strategically position Australia centrally within global mRNA manufacture and research.					

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FT220100738	**A top-down approach to synthesising high-value fluorocarbons**	228,042.00	228,042.00	233,042.00	233,042.00	922,168.00
Young, Asst Prof Rowan D	Fluorocarbons' ability to impart high stability, solubility, and unique reactivity to host molecules renders them invaluable in agrochemicals, pharmaceuticals, polymers and surfactants. Their robustness also renders them environmentally persistent. There are no industrially utilised methods for the re-purposing or recycling of fluorocarbons. This project aims to generate new methods for the selective activation of carbon-fluorine bonds in polyfluorocarbons, allowing their incorporation or repurposing into high value chemicals and/or easy derivitisation to access a plethora of new fluorocarbon products. Expected outcomes will allow new processing methods to value add to fluorocarbons while preventing their environmental release.					
	National Interest Test Statement Fluorocarbons are compounds that are essential components of many modern chemicals used by Australians including refrigerants, soaps, plastics, pesticides, herbicides and pharmaceuticals. As potent pollutants, the megatons of fluorocarbon waste generated each year present a significant environmental hazard. As such, Australia has committed to limiting the release of fluorocarbon waste as a signatory of the Montreal and Kyoto Protocols. Currently in Australia, disposal of fluorocarbons is limited to incineration, which is energy-demanding, carbon dioxide emitting and represents no economic benefit. This project will develop technology to recycle and upcycle fluorocarbon waste into valuable new fluorocarbons (waste-to-resource), avoiding their release into the environment and mitigating the negative effects of incineration. In addition to creating a new recycling industry in Australia the project will deliver immediate economic benefits through access to high-value pharmaceuticals and radiopharmaceuticals, whose syntheses otherwise requires the use of dangerous and expensive conventional fluorinating reagents.					
	The University of Queensland	2,497,534.00	2,480,446.00	2,486,986.00	2,441,575.00	9,906,541.00
University of Southern Queensland						
FT220100166	**Advanced Gas Diffusion Electrodes For Electrochemical Manufacturing**	214,210.00	196,710.00	206,210.00	196,210.00	813,340.00
Ge, Dr Lei	This project aims to develop electrochemical conversion technologies to convert carbon dioxide into globally needed chemicals. It targets the bottleneck issues in managing the gas-liquid-solid reaction sites and improving the conversion efficiency of reactor, through the synthesis of advanced electrode materials, understanding of mass transfer and the engineering design of an electrochemical reactor. The expected outcomes will promote carbon neutral goals, bridge the renewable energy storage and sustainable chemical manufacturing gap, thus addressing key challenges faced by Australia and the world.					
	National Interest Test Statement This project will deliver a novel electrochemical technology to convert simple gases into fuels and chemicals using renewable electricity. This technology will have wide applications across a range of process industries, enabling production of essential global commodities such as chemicals, liquid fuels, and fertilisers, from simple gases such as carbon dioxide and nitrogen. The project will also offer a viable route to reducing atmospheric CO2, either directly or through capture from power generation emissions, contributing to greater environmental sustainability. Uptake of successful research outcomes will position Australia as a global leader in a technology of global economic and environmental importance. It will create opportunities for new, local manufacturing companies to provide chemicals and fertilisers for Australia's agricultural industry, while also reducing Australia's reliance on fossil fuels in creating these essential global commodities. The technology will drive the development of new industries, underpinning economic growth and will contribute to the decarbonisation of Australia's economy.					
	University of Southern Queensland	214,210.00	196,710.00	206,210.00	196,210.00	813,340.00
	Queensland	3,433,625.00	3,434,649.00	3,444,689.00	3,423,278.00	13,736,241.00

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South Australia						
Flinders University						
FT220100054	**Sulfur-based materials for infrared optics and thermal imaging**	252,481.00	262,481.00	262,481.00	262,481.00	1,039,924.00
Chalker, A/Prof Justin M	This project aims to investigate novel sulfur polymers for use in infrared optics and thermal imaging. Current thermal imaging lenses are made in energy-intensive processes from expensive semiconductors and toxic chalcogenide glasses. In contrast, highly abundant elemental sulfur can be converted into polymers that are highly transparent to mid- and long-wave infrared light, providing a promising low-cost alternative. In developing this technology, expected outcomes include novel methods to manufacture polymers from low-cost sulfur and their use as lenses for thermal imaging. Significant benefits are expected, such as access to low-cost, recyclable materials for thermal imaging required in surveillance, diagnostics, and spectroscopy.					
	National Interest Test Statement					
	Thermal imaging is used in medical diagnosis, surveillance, and in the operation of autonomous vehicles. The lenses used in thermal imaging equipment are, unfortunately, made from expensive substances such as germanium or toxic substances such as selenium and arsenic. This project aims to use highly abundant sulfur to make thermal imaging lenses that are low-cost, recyclable, and safe. Additionally, the method of manufacture for the sulfur materials is more amenable to high-throughput moulding that is not possible with traditional materials used in thermal imaging. The benefits to Australia in developing this technology are potentially immense: economically, thermal imaging is estimated to be a $15B market so lower-cost technologies could be commercially valuable as the market expands into new commercial sectors such as self-driving cars. Furthermore, surveillance systems based on thermal imaging are critical for defence and the security of Australia. The materials developed in this project could, for instance, improve night vision capabilities and surveillance systems of Australian Defence forces.					
FT220100078	**Indigenous Living-Legacy Archives: Memory Story Innovations for our Time**	221,266.00	222,268.00	226,686.00	238,686.00	908,906.00
Harkin, Dr Natalie A	This project aims to investigate Indigenous community and colonial archives as powerful sites of social and cultural memory, and creative intervention. These sites can locate, repatriate, and transform fundamental narratives of history and collective memory to reassert and determine Indigenous voice and agency. This work partners with peak Indigenous arts and archive networks to demonstrate the value of Indigenous living-legacy archive innovations and initiatives for cultural preservation and renewal, through unique community-led modes of storytelling. It benefits community wellbeing and healing through self-determined knowledge production and memory stories of local and global impact, and truth-telling legacy work for future generations.					
	National Interest Test Statement					
	Colonial archives represented in public institutions like galleries, libraries and museums have historically lacked Indigenous engagement and perspectives. This research project will examine contemporary and Indigenous community-led archives that aim to reinstate Indigenous voice to the public record in unique ways. The research will focus on Indigenous-centred creative works that draw on archival records and oral histories, and contribute to important local, state and national stories. It will supplement and engage with colonial archives as ethical sites of encounter, respect and collaboration with Indigenous communities. Outcomes include a deeper understanding of Australia's history and contemporary life through public engagement with new and creative modes of Indigenous storytelling. These new archives will benefit both Indigenous and non-Indigenous Australians, support community wellbeing and healing in the Australian community, and provide a balanced and truth-telling legacy for future generations.					

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FT220100184	**Dead Heart Beating? Landscape, Climate and People in Desert Australia**	216,542.00	244,008.00	245,542.00	247,508.00	953,600.00
Moffat, Dr Ian A	This project aims to undertake the first detailed investigation of the archaeology, landscape history and paleoenvironment of dryland lakes in the Simpson, Strzelecki and Stuart Stony Deserts in Central Australia. Using cutting edge methods, the project expects to discover new archaeological sites, provide a new climate record for inland Australia and develop innovative new analytical and field techniques. Expected benefits also include the development of new cutting-edge methodologies for the investigation of Australian desert landscapes, comprehensive baseline data of how this region has evolved prior to European colonization and resolving why no Pleistocene aged archaeological sites have been found in the region.					
	National Interest Test Statement This research will investigate the archaeology and environmental history of dryland lakes in the Simpson, Strzelecki and Sturt Stony Deserts in Central Australia. This region is a globally significant arid landscape with a rich human and natural history. It includes the Munga-Thirri–Simpson Desert and Malkumba-Coongie Lakes National Parks and a Ramsar Wetland site and makes an important economic contribution to Australia via the petroleum and pastoral industries. Innovative techniques, including satellite remote sensing, field survey, geochemistry, plant analysis, dating and archaeological excavation, will produce a comprehensive understanding of water distribution, landscape change and Indigenous occupation over the last 60,000 years. These results will reveal when, where and how people have lived in arid regions and benefit Australia by providing the first comprehensive understanding of how these deserts have changed over time. This will be used by Traditional Owners and land managers, who are co-discoverers on this project, to better manage this fragile landscape for future generations.					
	Flinders University	690,289.00	728,757.00	734,709.00	748,675.00	2,902,430.00
The University of Adelaide						
FT220100695	**Quantifying the economic and social impacts of drought in rural Australia**	261,648.00	260,464.00	260,141.00	253,026.00	1,035,279.00
Zuo, A/Prof Alec Z	Climate-change research predicts drought is likely to increase its frequency, duration and severity, drastically challenging Australian agriculture and rural societies. The aim of this project is to use innovative techniques to analyse (i) national datasets to determine the economic and social impacts of droughts in rural and regional Australia; and (ii) the results of a national survey to estimate and understand farmers' drought adaptation responses to carbon-credit market signals. The outcomes are expected to be a major step in developing and implementing cost-effective drought policies and services to minimise its complex impacts, strengthen rural and regional community resilience, and enhance sustainable agriculture in Australia.					
	National Interest Test Statement Drought typically starts without overt warning signs, making identifying impacts complex, costly, and challenging. Rigorous impact assessments are lacking in Australia, yet they are vital to effective and efficient drought policies that prepare farmers and rural communities for an increasingly hotter and drier climate. This project will use state-of-the-art modelling techniques to quantify drought's economic and social impacts in rural Australia and understand farmer preferences for carbon-credit trading as a market incentive to implement drought adaptations. It will identify drought's diverse impacts on different community groups and the associated impact pathways. Findings on the role farm, land and water management play in the impact pathways could be used by government agencies to allocate resources to specific measures that enable farmers to manage drought. The knowledge generated is expected to significantly improve the design, targeting and implementation of drought policies.					
	The University of Adelaide	261,648.00	260,464.00	260,141.00	253,026.00	1,035,279.00
	South Australia	951,937.00	989,221.00	994,850.00	1,001,701.00	3,937,709.00

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Tasmania						
University of Tasmania						
FT220100096	**Faster, greener, stronger: a new approach to synthesis of polymer materials**	239,089.00	243,239.00	242,414.00	217,828.00	942,570.00
Thickett, Dr Stuart C	The project will investigate new approaches towards polymer material synthesis in the complete absence of hazardous solvents, with the aim of creating materials that have superior physical or chemical properties compared to those prepared using existing methods. This project is significant for driving advances in material design and characterization using simple starting materials and environmentally sustainable conditions. Expected outcomes include the production of unique nanomaterials, hydrogels and polymer monoliths with targeted applications, in addition to advances in 3D printing. This project will significantly benefit the sustainable material manufacturing industry into the future.					
	National Interest Test Statement					
	The minimization of hazardous chemical waste is recognized by the United Nations as an issue of global significance within their Sustainable Development Goals framework. This project will deliver effective new approaches to this challenge, by preparing high performance polymers materials using benign, environmentally friendly and recyclable designer solvents. This approach will yield polymers with greater mechanical strength and toughness at faster production rates compared to current routes, in addition to eliminating waste. In addressing this challenge, this project will provide significant benefit to Australia's advanced manufacturing sector. New routes to material synthesis will be created, enabling specific advances including an increase in 3D printing fabrication rates and capability, and the design of porous materials for chemical extraction and separation that will see likely commercial translation. The techniques developed and training opportunities provided will benefit local industries and strengthen Australia's international reputation and research capacity in polymer and materials science.					
FT220100210	**Tackling land degredation: which policy, where, when, and why?**	227,876.00	223,919.00	229,176.00	224,197.00	905,168.00
Adams, Dr Vanessa M	This project aims to tackle the global problem of land degradation with approaches to policy design that combine qualitative and quantitative impact evaluations. By 2050 more than 90% of the Earth's land area will be affected by human exploitation. Timely action is imperative in order to avoid, reduce, and reverse degradation, especially through land clearing. Intended outcomes include evidence-based policy recommendations to curtail land degradation: which interventions to apply, where, when, and why. Among expected benefits are enhancements to how we design and implement environmental interventions, improve wildlife habitats, conserve biodiversity, and ensure continued provision of nature's benefits in Australia and internationally.					
	National Interest Test Statement					
	Australia's precious water and vegetation resources are at risk of slowly disappearing due to widespread land degradation across the nation. Protecting the highly valued assets of soil, vegetation, species biodiversity and water quality will ensure that all Australians have improved food and water security, safe shelter, and recreational space. This project will investigate which policies have delivered tangible benefits to Australia in terms of environmental outcomes (e.g. healthy vegetation and freshwater systems) and socio-economic outcomes (e.g. equitable access to outdoor spaces, clean water and homes that are safe from environmental disasters). This project will identify which policies have the greatest impact. In doing so it will provide our nation's decision makers with an evidence-based tool by which they can better target policy interventions and resource investment, promising both impact and value for money while maximising native vegetation health and threatened species recovered, and, ultimately, securing Australia's extraordinary natural heritage.					

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FT220100652	**Urban greening to protect vulnerable people and promote thermal equity**	262,376.00	274,097.00	268,526.00	254,391.00	1,059,390.00
Byrne, Prof Jason A	This project aims to create, test and apply new knowledge to promote thermal equity in Australian cities. Climate change is increasing heatwave frequency and intensity as our cities are becoming denser and their populations growing older. Many older people have heightened vulnerability to extreme heat due to income constraints, medical conditions, physical frailty, and reduced mobility. Outputs will include a heat vulnerability assessment index for identifying at-risk places and vulnerable people, urban tree canopy maps, urban planning policy guidelines for creating cooler cities, and a toolkit for identifying appropriate green infrastructure treatments. Benefits include avoidance of heat-related deaths and improved liveability in cities.					
	National Interest Test Statement This Future Fellowship will benefit Australians by producing impactful research to help reduce heat-related disease and death among vulnerable populations in Australia's cities. Research findings are expected to reduce economic and social costs associated with extreme heat events. The findings will especially benefit older urban residents, contributing to their longevity and wellbeing, and enhancing climate responsiveness in cities. The research will have flow-on benefits for other vulnerable groups such as outdoor workers and children. It will directly address the Australian Government's Science Research Priority in Environmental Change, producing two main outcomes. First, the research will enable local governments to effectively assess how heat is distributed across cities to target suburbs requiring urban greening to make them cooler for residents and workers. Second, it will help town planners and environmental managers to increase urban tree cover by providing policy guidance for tree selection, protection, and maintenance on public and private land.					
	University of Tasmania	729,341.00	741,255.00	740,116.00	696,416.00	2,907,128.00
	Tasmania	729,341.00	741,255.00	740,116.00	696,416.00	2,907,128.00

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Victoria						
Deakin University						
FT220100062	**Improving School Engagement of African Refugee Students**	203,886.00	188,437.00	194,414.00	197,337.00	784,074.00
Molla, Dr Tebeje	Using a multimethod research design, this project aims to investigate the problem of school disengagement among African students from refugee backgrounds. By building new knowledge that can inform policy responses and school practices, this project contributes to improving educational attainment and integration outcomes of refugee students in Australia. Expected outcomes of the project include new insights on causes and manifestations of school disengagement among African refugee students and a Framework of Engagement that outlines viable strategies for addressing the challenge. The study should return tangible benefits through raising the academic outcome, economic participation, and wellbeing of students from refugee backgrounds.					
	National Interest Test Statement					
	For refugee youth, schooling is a critical gateway to culture learning and successful resettlement. At school, they acquire the knowledge and skills they need to meaningfully integrate with society. The value of schooling is particularly important for African refugees who arrived at a young age with limited education. However, African refugee students are at high risk of school disengagement. This project generates new knowledge that informs policies and practices that promote the academic and social engagement of refugee youth. Improved educational attainment enables the refugee youth to participate actively in the socio-economic lives of the community, which has direct implications for the economic productivity and social cohesion of Australia. The project also has strong potential to support the successful implementation of current government policies (e.g. Multicultural Access and Equity Policy Guide, the Alice Springs [Mparntwe] Education Declaration, and the Victorian African Communities Action Plan) that call for targeted support for disadvantaged students, including those from refugee backgrounds.					
FT220100351	**Prefrontal dopamine in the dynamic processes of learning across lifetime**	262,159.00	262,159.00	262,109.00	262,109.00	1,048,536.00
Kim, A/Prof Jee Hyun	To facilitate age-specific adaptive action in a changing environment, how we learn changes not only as we grow, but also as we age. However, the neurobiological processes in these age-related changes are poorly studied. This is a significant knowledge gap that needs to be addressed to promote healthy cognitive development and ageing. This research program aims to examine the contribution of prefrontal dopamine and its receptors D1 and D2 in associative learning and its inhibition at 9 distinct ages spanning development to ageing in male and female rats. The outcomes will provide a new neuroscientific framework to understand learning and memory throughout life, which will foster new research opportunities and inform our education and health.					
	National Interest Test Statement					
	The project will show how memory processes and intensity change throughout life and differently between the sexes, and how the brain chemical dopamine is involved, all poorly understood. Prescribed and illegal dopamine-based drug use is rising in Australia, our efficacy of early education is falling in world rankings and our ageing population is rapidly increasing, all associated with memory impairments. This project will have immediate relevance to Australian education, helping us understand why and how to intervene at different ages and between sexes. Working with stakeholders in education and government and applied researchers, we will use the new knowledge to improve current and design new strategies for application and evaluation in schools to improve learning and outcomes. Overall the greater understanding of the role of dopamine in memory will help inform safer use and development of improved dopamine-based drugs to improve memory, especially with ageing and other adverse exposures.					

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FT220100690	**Healthy infant and young child diets from sustainable first-food systems**	181,757.00	181,757.00	181,757.00	186,737.00	732,008.00
Baker, Dr Phillip I	Breastfeeding, breastmilk and other first foods consumed during infancy and early childhood, are currently neglected in food systems research and policy action, despite their importance to establishing life-long dietary preferences, health and sustainability. This project addresses this gap, by developing a novel 'first-food systems' conceptual framework, describing global, regional and national changes in infant and young child diets, and generating end-user knowledge to generate political commitment for early-life nutrition. This research will deliver economic, social and environmental benefits for Australia and international communities, by helping to reduce the ill-health and environmental harms linked with unhealthy early-life diets.					
	National Interest Test Statement					
	This research will develop new knowledge that will inform policy actions to enhance the health and sustainability of food systems for infants and young children, and help to sensitise the current international food systems transformation agenda to the importance of breastfeeding, breastmilk and other first foods, which are currently neglected. This will provide benefits to Australian infants, young children and mothers, and policy makers who will benefit from evidence on the determinants of early-life dietary change. As a major food producing nation with a high burden of chronic diseases that begin in childhood, the research can inform the development of new strategies for realising economic, social and environmental benefits from the Australian food system. To deliver these benefits, the programme of work develops a new framework for understanding the drivers of infant and young child dietary change. It engages with Australian and international stakeholders to generate new thinking about what actions can be taken to generate political commitment for early-life nutrition and reverse the neglect.					
FT220100769	**Coexisting with Coronaviruses: Rethinking the Emergence of the Pandemic**	268,700.00	266,200.00	282,550.00	244,500.00	1,061,950.00
Kirksey, A/Prof Eben	Before COVID-19 disrupted modern life, benign coronaviruses were circulating among people and animals in Southeast Asia. As medical researchers work to control the spread of this infectious disease, multispecies ethnography has a special role to play in generating basic knowledge about coronaviruses. This project aims to understand how interactions between people and multiple animal species generated a virus with pandemic potential. Approaches from science studies and the environmental humanities will generate conceptual innovations related to three themes: viral visibility, coexistence, and pathogen emergence. Innovations in multispecies methods should produce knowledge about viruses with broad benefits that may safeguard future health.					
	National Interest Test Statement					
	This project will fill several critical gaps in knowledge regarding the factors that led to the emergence of the COVID-19 pandemic. Human interactions with animals – such as bats, cats, pangolins, and pigs in Southeast Asia, result in the routine transmission of coronaviruses from animals to humans. Only a small minority of the viruses that jump across the species barrier result in an outbreak of serious infectious disease. This work seeks to understand how humans are able to coexist with some viruses and why other viruses become pathogenic. Knowledge about emergent viruses will help policy makers guard against future pandemics. The key findings of this project will be presented to elected officials through direct briefings, articles in mainstream media outlets, and publications in the Alfred Deakin Institute (ADI) Policy Briefing Paper series. This project will generate concrete policy recommendations that will help protect our economic, commercial, social, and cultural sectors from future disruptions by infectious disease.					
	Deakin University	916,502.00	898,553.00	920,830.00	890,683.00	3,626,568.00
La Trobe University						
FT220100405	**Developing serial crystallography for room temperature structure & dynamics**	256,802.00	213,082.00	215,862.00	205,002.00	890,748.00
Zatsepin, Dr Nadia	This project aims to uncover the molecular structural dynamics of a bacterial enzyme responsible for protein folding in bacteria. This project expects to generate new knowledge to guide the development of a new type of antibacterial to circumvent antibiotic resistance. Expected outcomes of this project include new experimental, computational and simulation tools for dynamic X-ray crystallography including new capabilities at the Australian Synchrotron for very small microcrystals of any biomolecule. This would provide a powerful new tool for the Australian structural biology community that should accelerate fundamental discoveries, including facilitating high-resolution structure determination of membrane proteins and drug development.					

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(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
	National Interest Test Statement Antimicrobial resistance (AMR) is increasing globally, and the discovery of new antimicrobials has severely stagnated. By 2050, the impact of AMR on healthcare costs is forecast to reach an estimated USD $300 billion to $1 trillion annually, worldwide. The outcomes of this project can help mitigate this dire impact on health and the economy by providing unique critical insight into a bacterial protein that is the target of a new type of resistance-proof antibacterial drug. This project also builds on Australia's significant investment in X-ray science by establishing new, broadly applicable capabilities at the Australian Synchrotron that will enable the study of dynamics of such enzymes (biological catalysts) as well as advanced high-performance materials. Future applications of this work will contribute to Australia's national well-being and economic growth, delivering (a) more effective pharmaceutical drugs with fewer side effects, (b) new materials with unique properties for industrial use such as catalysis, toxin removal, desalination, artificial photosynthesis for carbon capture and clean energy generation.					
	La Trobe University	256,802.00	213,082.00	215,862.00	205,002.00	890,748.00
Monash University						
FT220100023 Johnson, Dr Travis K	**How is the blood cell population size controlled?** Macrophage-like cells are an ancient animal blood cell lineage critically important for development, immunity, and homeostasis. This fellowship seeks to reveal the genes and control mechanisms used by animals to achieve an optimally-sized army of these cells - to contain threats for survival upon infection, heal following acute stress exposures, or for development, ongoing maintenance, and repair of wear and tear. By marrying the genetic tractability of the model organism Drosophila and its simple, yet conserved blood cell system, this project will yield new insights into the mechanisms that govern the animal blood cell population. This will benefit our fundamental understanding of how animals maximise their health throughout life.	194,789.00	198,014.00	195,915.00	195,876.00	784,594.00
	National Interest Test Statement There is a lack of understanding about how animals control the size of their blood cell populations. Gaining fundamental insights into how and why animals (including humans) grow and shrink their blood cell populations is in Australia's national interest because it will enable an advanced understanding of key cellular processes that underpin health and ageing. Blood cells serve to protect and repair the body, and therefore the knowledge generated has the potential to be harnessed in fields such as regenerative medicine with the goal of promoting the repair of injured or aged tissue and enhancing longevity. This could occur via the development of future new therapies together with the pharmaceutical sector, or via alternative means including novel environmental and nutritional interventions. As animals include livestock, pets, native wildlife and humans, a new understanding of blood cell population control will likely lead to significant benefits to the Australian community through economic, commercial, and environmental gains.					
FT220100290 Edmonds, Dr Mark T	**Kagome metals: From Japanese basket to next generation electronic devices** This project aims to investigate a new material that is very promising for electronic devices that can operate faster, and be more energy efficient than today's silicon-based technology. Kagome metals have topological non-trivial nature and can pass current without resistance, making them ideal for next-generation electronic devices. This project aims to grow Kagome metals in the ultra-thin layers needed to realise this potential, make devices and study their electronic properties. Expected outcomes of the project will include showing Kagome metals can form the basis of ultra-low energy electronic devices, as well as having future applications in high-temperature fault-tolerant quantum computing.	223,498.00	194,848.00	193,298.00	190,898.00	802,542.00
	National Interest Test Statement This project will investigate a new class of materials, Kagome metals, that may enable electronic devices to operate faster, and be more energy efficient. The project will explore new ways to make atom-thick Kagome metals and measure their electronic properties, in order to understand how they can be used for future electronics. Electrical currents in Kagome metals may flow without heat loss at much higher temperatures than other materials. The project aims to demonstrate these currents at room temperature, a necessary step towards device applications. New devices based on Kagome metals would consume significantly less energy when performing switching operations (the control of electrical signals in most modern electronics), which currently consume 10% of the world's energy. The project will generate valuable new knowledge to stimulate further research in electronic materials physics, as well as generate intellectual property for commercial translation and build a foundation for Australian industry in next-generation electronics.					

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FT220100294	**The neurobiology of curiosity**	226,020.00	226,020.00	224,998.00	198,890.00	875,928.00
Chong, Dr Trevor	This project aims to define the neurobiology of curiosity by combining cutting-edge techniques in computational modelling, pharmacointervention and neuroimaging. It is expected to lead to a comprehensive neuroscientific framework of curiosity, which will characterise its evolution over the lifespan, and its dependency on key neurotransmitter systems. Expected outcomes include a legacy of open access stimulus & data sets; the development of a global collaborative network; and an increase in our national capacity and profile in decision neuroscience. The benefits of this project include laying the foundations for future interventions to improve curiosity, with potential downstream effects on many aspects of education, social & public policy.					
	National Interest Test Statement					
	Curiosity is the bedrock of learning, education, and discovery. However, despite the pervasive importance of curiosity to human behaviour, we have a poor understanding of the fundamental brain processes that drive it. The goal of this project is to understand the biology of curiosity across the lifespan. The outcome will be a comprehensive explanation of what makes people curious, and why. The pathway to adoption of this research will involve the development of behavioural strategies and learning environments that enhance our curiosity, which can be commercialised to maximise educational outcomes, increase work-place productivity, and drive scientific discovery. In addition, the results of this research can be applied by industry to develop tailored strategies and interventions that are able to stimulate and sustain new hobbies and interests in individuals of all ages. This in turn has the potential to benefit the Australian community by increasing psychological resilience, learning, and community and social engagement across the lifespan.					
FT220100496	**Next-generation methods for transport in poroelastic media with interfaces**	270,000.00	270,000.00	270,000.00	270,000.00	1,080,000.00
Ruiz Baier, A/Prof Ricardo	Deformable porous structures are ubiquitous in the design of materials such as filters, sponges, and prosthetics. They often show complex mechano-chemical processes that occur across several spatio-temporal scales. To mathematically describe them requires coupled sets of nonlinear, multiphysical, and multiscale equations. This makes the design of accurate, efficient numerical methods challenging. The Fellowship aims to address the mathematical characteristics encountered in poromechanics equations and their discretisation methods, and to devise novel mathematical and computational techniques for extending the analysis to cases where large deformations and the presence of interfaces and coupling with other neighbouring elements are relevant.					
	National Interest Test Statement					
	This Fellowship will develop next-generation mathematical methods for modelling permeable materials (eg. sponges, textiles, skin and volcanic rock) that change shape when exposed to many environments or different temperatures. Examples are rock fractured during oil and gas exploration, smart filters that remove contaminants from water, and porous living tissue like eyes. Such materials are critical in many applications, but current models cannot accurately predict how the different materials respond to changes in environment. The project will create new theory and tools for solving major problems in industry through the combination of engineering, biomedicine and computational mathematics. Examples of possible applications include significantly raising the efficiency of (i) water usage needed for lithium mining, (ii) location of and drilling at geothermal electricity production sites, and (iii) waste-water treatment. Through the dissemination of the findings, this project will assist industry in solving problems and also increase public awareness of the critical role of modern mathematics in tackling industry's programs.					
FT220100509	**Ethical frameworks for responsible innovation of neurotechnology**	277,481.00	277,481.00	276,481.00	245,481.00	1,076,924.00
Carter, A/Prof Adrian N	This project aims to ensure the ethical and efficient innovation of emerging neurotechnologies, including implantable brain devices, synthetic drugs and direct-to-consumer brain devices. This project expects to generate Australian's first responsible innovation framework through extensive community engagement. Expected outcomes of this project include: guidelines for the development of neurotechnologies; a national framework for responsible innovation; partnerships with international brain initiatives; and enhanced interdisciplinary capacity. The proposed research should provide significant benefits: innovation of technologies that meet Australians' needs, reduced misuse and harm, and greater social support for innovation in neuroscience.					

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	National Interest Test Statement Neurotechnologies aimed at enhancing brain health and performance, such as brain-computer interfaces, synthetic drugs and commercial wearable devices, are proliferating globally. With an estimated value of $USD 13.3 billion per year, the industry has the potential to reduce cognitive decline, which costs Australia $500 million per day. However, these technologies raise fundamental ethical and social challenges to privacy and discrimination, responsibility, equity, agency, consent and coercion. Australia currently lacks an enforceable ethical framework to guide and regulate their development. This project will develop the first national framework for responsible innovation of neurotechnologies to ensure that new and emerging technologies meet the needs of all Australians, are provided ethically and efficiently, and with minimal harm. Practical resource packs will be disseminated to guide policy and practice for neurotechnological innovation in Australia, enhancing regulatory and policy frameworks for the design of emerging neurotechnologies, and ensure a more efficient and prosperous neurotechnology sector.					
FT220100564 Creek, A/Prof Darren J	**Discovery of new metabolic functions in Plasmodium parasites** This research will provide new understanding about the metabolism of parasites, such as those that cause malaria. These parasites have evolved bespoke metabolic networks to survive in diverse host environments including mosquitos and humans. Previous studies have revealed many unique genes and metabolites in these organisms, but their biochemical function is not known. This project will use state-of-the-art metabolomics and proteomics technology to accurately identify novel metabolites produced by the parasites, and discover the enzymes that are responsible for their synthesis. This work will not only advance our understanding of cellular metabolism, but will provide new opportunities for future biotechnology applications.	266,481.00	266,481.00	266,481.00	266,481.00	1,065,924.00
	National Interest Test Statement This project will provide fundamental new understanding about the metabolism of parasites, such as those which cause malaria. Specifically, the project will develop new knowledge on the biology of the malaria parasite, enabling future advances in the management of malaria, which is a major health security issue for our region. Furthermore, many of the findings will likely be applicable to other parasites of medical, veterinary, agricultural and environmental importance through better chemical design to inhibit harmful parasites, or by revealing unique approaches to detect parasites that cause health or biosecurity concerns. The project will develop tools that will enable new approaches for malaria diagnostics and drug targets in further research. One example would be that the discovery of new enzymes in malaria parasites could allow future discovery of new drugs that inhibit this enzyme. Likewise, the discovery of novel cellular chemicals could allow the development of faster, more sensitive diagnostic devices that detect these chemicals.					
FT220100617 Veldhuis, Dr Nicholas A	**Understanding and controlling neuropeptide GPCR-transducer coupling** G protein-coupled receptors (GPCRs) are physiologically essential, yet the spatiotemporal complexity of receptor function has limited our understanding of their function and success in drug development. Using a multi-disciplinary approach integrating GPCR signalling, trafficking and drug delivery, this research program aims to understand, and control, the molecular mechanisms that enable a single receptor to respond to different ligands to promote unique cellular processes. The anticipated outcomes include an enhanced capacity for understanding fundamental biology, and stronger national and international collaborations. It will provide significant benefits including expanded basic knowledge and advancement of drug delivery technology.	228,042.00	228,042.00	228,042.00	228,042.00	912,168.00
	National Interest Test Statement G Protein-Coupled Receptors are the largest family of receptors in the body, contributing to all physiological processes. They are historically considered to function as cell surface sensors, but are also found within the interior of cells. Although widely studied and ubiquitous targets for drug treatments, we still do not understand how receptor location within a cell influences function. This proposal will investigate how multiple peptides can bind and activate a single receptor, and promote distinct functions by influencing its movement to different cellular sites. This knowledge opens up new avenues for targeted delivery of drug candidates, as well as new classes of therapies. The anticipated outcomes include an expanded fundamental understanding of cell signalling for peptide receptors, and developing new tools to investigate possible therapeutic avenues. It has potential to provide economic and commercial benefit through innovative delivery technologies and unique assays for use in the biotechnology sector.					

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FT220100679	**Reducing rocket resonance is the key to safer spaceflight**	238,767.00	243,793.00	237,888.00	227,093.00	947,541.00
Edgington-Mitchell, Dr Daniel M	This fellowship considers a particularly dangerous component of rocket launch, which is the potential for destructive feedback loops to form either in the nozzle, or between the nozzle and the launch pad. CI Edgington-Mitchell is a world leader in the study of resonance in jet engines, having developed best-in-field methodologies for the problem. In this innovative fellowship, he will apply these methodologies to better understand the dangerous resonances that can occur during rocket launch, using a combination of experimental, numerical, and theoretical techniques, in partnership with NASA, Stanford, and the CNRS.					
	National Interest Test Statement					
	This project aims to improve the safety of rocket launches by predicting and ultimately controlling the intense sound waves generated by a rocket's exhaust. These sound waves are so loud that they can damage the structure of the rocket, leading to catastrophic failure on the launchpad. In some cases, the sound becomes amplified by a feedback loop, making it even more dangerous. By better understanding the source of these soundwaves and feedback loops, this project will facilitate the design of safer, more reliable, and more efficient rocket nozzles. The project will also develop Australian capability in an important component of space launch, via a small-scale launch testing facility suitable for the Australian context. These developments will benefit Australia through the embedding of links with major space agencies and will enhance the competitiveness of the emerging Australian space industry.					
FT220100742	**Countdown to death: defining new signalling events preceding cell death**	194,918.00	194,918.00	194,918.00	194,918.00	779,672.00
Lalaoui, Dr Najoua	This proposal aims to understand how programmed cell death molecular machineries promote innate immune responses and proliferation by identifying new molecules that regulate these fundamental biological processes. This project expects to enhance our basic understanding of cell death, cell proliferation and innate immunity using innovative approaches and to build interdisciplinary collaborations. The new generated knowledge in these critical processes will be fertile ground to develop innovative applications in biomedical industries. This this will have a positive impact on the health and economy of Australian society.					
	National Interest Test Statement					
	Cell death pathways are critical in maintaining animal life. A disruption to any of these pathways can underlie serious degenerative and autoimmune diseases or many cancers. This project will investigate how cell death is connected to innate immunity and proliferation. The proteins and pathways to be studied in this project are highly conserved, with homologs found in plants, viruses, fungi, bacteria, through to insects, worms and mammals. By identifying novel molecules that regulate cell death, cell proliferation and inflammation, this project will lead to pharmaceutical/biotechnology investment to control and target these molecules and pathways that will have a positive impact on the health and economy of Australia in the biotechnology, agricultural and veterinary domains.					
FT220100749	**Engineering nanoscale tools for cellular interrogation**	226,702.00	224,242.00	224,792.00	218,442.00	894,178.00
Elnathan, Dr Roey	The aim is to address fundamental hurdles to engineering seamless nanobiointerfaces between electroactive nanoscale tools and living cells. This is expected to allow efficient delivery of many bioactive cargo types into cells, intracellular sampling of cytosol contents, and probing of action potential, all at the cell—material interface. New, powerful, electroactive nanoscale tools that deliver precise spatio-temporal resolution and minimal invasiveness and perturbation are likely to transform ex-vivo cellular processes. The intended outcomes are crucial for maximising precision in engineering and implementing of ex-vivo cellular processes. Fundamental advances in knowledge may eventually be a platform for developing cell-based therapies.					
	National Interest Test Statement					
	The project will develop a breakthrough technology to solve a long-standing challenge in biomedicine: how to inject genetic materials into cell interiors with much greater precision, but without damaging the cells' intricate structure. My team will create tiny (nano) needles of specific dimensions to deliver genetic materials such as DNA into cells, giving them powerful new properties – including such functions as attacking specific cancer cells. These nanoneedles will also enable diagnosis of the health of cells by drawing out tiny volumes of their existing genetic material. These advances will have major potential as a platform for novel cell-based therapies for conditions that until now have eluded medical science such as cancers and heart disease, or for which current therapies are too slow and costly to be viable. Such a fundamental advance would open new ways of manipulating cells outside the body, creating intellectual property that would be highly attractive to Australian and international companies.					

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FT220100835	**Parallel Lines: Ultra-dense optical systems for extreme data-rates**	226,654.00	226,654.00	226,654.00	198,042.00	878,004.00
Corcoran, Dr William P	The project aims to explore methods to significantly expand global internet data rates, by using emerging ultra-dense optical technologies. The project plans to discover how novel existing and emerging tiny photonic chip devices may enable the use of new, unused optical spectral bands, and then enable 1000s of channels to be supported by exploiting newly available parallelism in both wavelength and space. Success in the project aims may enable speeds of up to 100 times greater than achievable today, in a variety of fibre optic systems. Connectivity is key to our society, so benefits may arise in both future-proofing key Australian data infrastructure, and in providing a roadmap to support exponential capacity growth over the coming decades.					
	National Interest Test Statement Optical communications systems provide the backbone of the internet and our connected society, and our collective demand for data grows exponentially by 25% every year. This project aims to devise new methods to dramatically increase the data capacity of optical fibre systems by 5-10 times. The new technologies developed in the project aim to enable this speed and capacity increase without significant increases in cost and energy consumption. If successful, the new technologies planned for in the project could be deployed in existing fibre optic networks, which will enhance national information infrastructure (such as the NBN), to support faster home internet speeds, faster mobile networks, and advanced applications (like remote mining, remote medicine & cloud computing). This project directly leverages new technologies developed in Australia, and new intellectual property from the project is likely to underpin new growth directions for Australia's established $4 billion photonics industry.					
	Monash University	2,573,352.00	2,550,493.00	2,539,467.00	2,434,163.00	10,097,475.00
RMIT University						
FT220100515	**Bottom-up multiscale modelling of expansive soils in natural environments**	261,000.00	264,000.00	264,000.00	264,000.00	1,053,000.00
Zhou, A/Prof Annan	Expansive soils, highly sensitive to the environment, undergo dramatic strength and volume changes. This project aims to advance our understanding of expansive soils under different temperatures, hydraulic conditions, mechanical loads, and aqueous salinities. The project expects to use a combination of multidisciplinary knowledge, multiscale experiments and numerical simulations. The outcomes are a new multiscale model and advanced analysis/design tool for evaluating the performance of expansive soils under different conditions. The outcomes should provide the efficient way to mitigate the significant damage caused to infrastructure by expansive soils and facilitate the application of expansive soil products in waste disposal systems.					
	National Interest Test Statement Expansive soils cover more than 20% of Australia’s surface, most of which is the populated regions. Their strength and deformation are highly sensitive to the mineral composition, load, temperature, moisture and salinity. Expansive soils are blamed for geotechnical engineering problems that cause many injuries and even loss of life, and billions of dollars of economic losses. This research will advance understanding of expansive soils. Multiscale models and analysis tools will be developed to better predict the behaviour of expansive soils under different conditions. They will allow engineers to better design foundations, slopes, pipelines, tunnels and other infrastructure in expansive soils and expansive clay barriers used in geological storage of radioactive and toxic waste. This will mitigate or prevent the damage caused by expansive soil problems and considerably reduce the costs incurred by Australian federal and state governments and building owners for repair and reconstruction, as well as the socioeconomic and environmental impacts on those affected when critical infrastructure is put out of use.					
FT220100552	**The Mourning After: Grief, witnessing and mobile media practices**	265,327.00	265,327.00	265,327.00	265,327.00	1,061,308.00
Hjorth, Prof Larissa	This project aims to understand the role of mobile media in grief rituals as a reflection of our social and cultural lives. Grief is an important cultural practice which is crucial in recovery from loss and developing resilience. As magnified by the pandemic, mobile media rituals—from Instagram memorials to witnessing mass death and online funerals—play a significant role in contemporary grieving processes. Through ethnographic inquiry, social media analysis and creative practice intervention, expected outcomes will include codesigned media-in-grief literacy frameworks, online resources and socially-engaged art exhibition. Benefits for understanding grief-in-media include building public empathy, connection and resilience.					

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	National Interest Test Statement COVID, climate disasters, war and inflation have prompted an outpouring of online grief and new online rituals. This project charts the social and digital dimensions of grief, from Instagram eulogies to Twitter memorials and online funerals. The research will reveal how Australians of varying ages and backgrounds experience grief through mobile media, and how grief is understood in our culture. Our grieving practices help to build resilience in individuals and society. This project will provide insights into the nuances of mobile media engagement, strengthening the way our culture supports and discusses grief. For example, older, isolated people will discover new ways to express, channel and share grief that will improve quality of life and ease social care needs. The project will guide Australian government agencies (health, youth, aged care, disaster relief), NGOs, teachers, health and media professionals to understand grief across age, faith and cultural diversity. Public events will promote positive grieving practices and support Australians to overcome loneliness and isolation associated with grief.					
FT220100559 Lin, Dr Han	**Adaptive nanofabrication of monolithic multifunctional sensing chips** This project aims to develop a new miniaturised graphene sensing platform integrating multiparameter sensing, wireless charging and data communication on a single chip to revolutionise the ubiquitous wireless sensing networks. By exploring the versatile laser nanofabrication, multiple devices can be inscribed into one flexible mini-chip for the first time. The chip can transform any objects into intelligent, multifunctional and energy-efficient sensors and find enormous applications in advanced manufacturing, logistics, health monitoring, supply chain and security. It underpins almost every sector of our daily life, securing Australia's internationally leading position in digitalisation and creating significant social and economic benefits.	208,845.00	207,570.00	207,291.00	206,003.00	829,709.00
	National Interest Test Statement This project will develop novel, low-cost, ultrathin, miniature wireless sensors using graphene for data acquisition that can be directly attached to any object to turn it into a node of the Internet of Things (IoT), connecting those objects and providing real time data such as humidity, temperature, pressure and location. They will play an important role in the Australian IoT industry, which is predicted to grow to over $18 billion by 2024. The sensors will have broad applications in Australian construction, manufacturing, healthcare, biomedicine, mining, and agricultural sectors, where the IoT is calculated to produce annual benefits of up to $300 billion. For example, the sensors can be applied like Band-Aids to a human body to monitor the health conditions of workers, athletes and the elderly. The intellectual property created by this project can be licenced to Australian sensor manufacturers, putting them at the forefront of this technology, expanding their businesses and creating new jobs. The sensors have the potential to contribute to productivity improvements in many Australian industries.					
FT220100618 Kuligowski, Dr Erica D	**Investigating Bushfire Evacuation Travel Behaviour in High-risk Communities** This project aims to investigate how and why people in popular bushfire-prone communities make travel-related decisions during bushfire evacuation. Rapid bushfire spread and limited transport capacity in densely populated areas at the rural interface create the 'perfect storm' for deaths and injuries. Missing from our knowledge is the role of human behaviour in such outcomes. Applying insights from social and computer sciences to engineering models, this project expects to generate new theory on resident and visitor evacuation travel behaviour in vulnerable areas during bushfires. Expected outcomes of this project include improvements to the tools used for community preparedness and response to increase Australia's resilience to bushfires.	225,000.00	235,000.00	235,000.00	230,000.00	925,000.00
	National Interest Test Statement By increasing our understanding of resident and visitor behaviour during evacuation from bushfire threat, this project will inform the tools used by emergency officials to plan for and make real-time decisions about safe and effective evacuation; addressing key recommendations (12.2, 12.6) from the 2020 Royal Commission into National Natural Disaster Arrangements. This project will also inform policies and practices in the design of new communities within bushfire prone areas, ensuring adequate capacities of egress routes and evacuation centres to meet the needs of diverse populations required to flee during emergencies. Among its other benefits, this project will enhance public awareness on bushfire threats and evacuation procedures, save the lives of those most at risk, and increase the resilience of bushfire-prone communities in Australia and around the world.					
	RMIT University	960,172.00	971,897.00	971,618.00	965,330.00	3,869,017.00

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Swinburne University of Technology						
FT220100798	**Uncovering the First Stars and Galaxies with the James Webb Space Telescope**	263,869.00	263,869.00	263,869.00	263,869.00	1,055,476.00
Labbe, A/Prof Ivo	This project aims to find "First Light": the first stars and galaxies that formed after the Big Bang. Understanding the astrophysics of the first galaxies, their explosive growth, and how they set ablaze the remaining gas in the Universe have long been among the most important unsolved mysteries of astronomy. Decades in the making, the launch of the James Webb Space Telescope in December 2021 marks a watershed moment. This project uses privileged access to the revolutionary space telescope to find "First Light" and contribute to rewriting the first chapter of our cosmic history. The project is expected to significantly enhance Australia's international standing through leadership in use of the world's flagship scientific facility.					
	National Interest Test Statement					
	One of the most important unsolved mysteries of astronomy is: what happened after the Big Bang? This project will leverage privileged access to the revolutionary James Webb Space Telescope to look at this critical period in time and answer the questions of how and when the first stars and galaxies formed. In addition to scientific benefits, the project will develop new methods in space-based data analysis and strengthen national capability in space data gathering, analysis, and data services, which have applications in resource monitoring and defence. This project will establish international collaborations with leading space science institutes in Europe, Israel, and USA, including NASA, and the groundbreaking discoveries are expected to inspire young Australians to take up careers in science and technology. The project contributes directly to 3 pillars of the Australian Civil Space Strategy: develop international collaborations, increase national capability in space, and inspire all Australians.					
FT220100841	**The many lives and deaths of high redshift massive quiescent galaxies**	263,869.00	263,869.00	263,869.00	263,869.00	1,055,476.00
Croton, Prof Darren J	This Fellowship will investigate the recent discovery of very massive, extremely early forming quiescent galaxies and explain their exceptional origin, death, and ultimate place in the local Universe. It is a multidisciplinary project that seeks to produce new knowledge using high-performance computing, software engineering, and sophisticated data analysis techniques. Expected outcomes include novel and improved supercomputer simulations of several billions of galaxies processed through a virtual observatory, providing tools and fundamental knowledge for observational, theoretical, and computational astrophysics.					
	National Interest Test Statement					
	Australia has a rich heritage of exploring the night skies. Galaxies like our Milky Way are abundant, but there are others that are 10+ times larger. These massive galaxies are rare and are more than 12 billion years old. However, recent discoveries have revealed massive galaxies that are inexplicably younger at 2-3 billion years old. In this project, we will investigate how these galaxies formed and evolved. It will leverage Australia's significant investments in national and international telescopes and supercomputing whilst strengthening international collaborations. The project outcomes will contribute to Australia's profile as a knowledge nation in STEM. It strongly focuses on training the next generation of scientists and applying highly technical and translatable skills, such as data science, analysis, and high-performance computing, that can be used in broader career paths. This project will further the Government's vision of engaging all Australians in science through public communication of its discoveries.					
	Swinburne University of Technology	527,738.00	527,738.00	527,738.00	527,738.00	2,110,952.00
The University of Melbourne						
FT220100091	**Charting the human brain connectome over the lifespan**	261,093.00	261,093.00	261,093.00	252,481.00	1,035,760.00
Zalesky, A/Prof Andrew	This project aims to develop neuroimaging reference charts for the human connectome and track the vast individual variability in brain connectivity across the life course. Connectomes will be mapped using tractography and diffusion magnetic resonance imaging data for 40,000 individuals, establishing the largest connectome biobank to date. Expected outcomes include an innovative lifespan brain charting platform, new paradigms to model individual brain variability and knowledge of how cognition, lifestyle and environment shape brain ageing. Brain charting will usher in a new era of precision connectomics, paving the way towards neuroscience-based personalisation of pathways in education, employment and wellbeing.					

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Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2022-23 (Column 4)	2023-24 (Column 5)	2024-25 (Column 6)	2025-26* (Column 7)	(Column 8)
	National Interest Test Statement This project will develop new ways to measure and track neural connections in the human brain in order to map changes and variability across the life span. The resulting biobank with comprehensive information on 40,000 individuals will yield knowledge of how cognition, lifestyle and environment shape brain ageing and will also support the establishment of evidence-based policies and action to promote active and productive ageing. Project outcomes will contribute to addressing challenges set out in the National Ageing Research Strategy that arise from an ageing workforce, including that by 2050, one quarter of all Australians are predicted to be aged 65 years or older. The project will deliver leading capabilities to facilitate new biotechnology commercialisation opportunities and foster industry linkages with leading medical imaging companies. Capitalising on Australia's competitive edge in neuroscience research, this project can transform the way that neuroscience informs individual decisions, societal systems and government policy.					
FT220100149 Liu, A/Prof Zhe	**Physics-based equivalent circuit models for nanoporous electrodes** This project aims to develop new physics-based equivalent circuit models for ion/electron coupled dynamics in electrified porous nanomaterials via fusing latest simulation advances with machine learning approach. This project expects to meet the challenge of high-efficient and accurate dynamic models for accelerated design, accurate diagnosis, and optimal operation of electrochemical energy storage and conversion technologies. The outcome will be a paradigm shift of how equivalent circuit models are developed and used, informed by new scientific knowledge and data. The proliferation of the new models will allow design and operation of more efficient and durable technologies in energy industry, benefitting Australian economy and environment.	261,093.00	271,943.00	265,593.00	263,943.00	1,062,572.00
	National Interest Test Statement The modern world has substantial and increasing energy demands that are compounded by national concerns for energy security and autonomy. This presents challenges for achieving the global energy transition of net zero carbon emissions by 2050, requiring the rapid replacement of traditional fossil fuels with alternative energy sources. By 2050 the transitional energy sector is predicted to increase global GDP by 2.5% based on employment growth. This project will advance dynamic models for electrodes, the hidden engines of electrochemical energy storage and conversion technology, allowing accurate diagnosis and optimal operation and performance of various energy technologies. Australia has vast opportunities in solar, wind, hydrogen, and ammonia; project findings will expand the science needed to harness these to underpin future energy supply and use systems. Adoption of findings and industry applications will contribute national economic and environmental benefits by enabling energy sustainability for resilient manufacturing and supporting energy resilient communities.					
FT220100253 Vogel, Prof Adam P	**Detecting and tracking alertness using speech biometrics** Traditional tests for detecting and tracking alertness are limited by their accuracy and inability to be administered without stopping work. This project aims to investigate how speech can be used to monitor changes in performance resulting from sleep deprivation and successive night shifts. The expected outcomes are 1) new knowledge on how sensitive speech and language features are for detecting change in alertness, and 2) development and verification of a highly accurate, cost-effective, speech focussed assay capable of detecting impaired alertness from otherwise healthy individuals. The project should benefit the way fitness for duty is tested and provide new methods for safeguarding Australians working in at-risk environments.	261,093.00	262,593.00	262,593.00	264,593.00	1,050,872.00
	National Interest Test Statement This project employs next generation, digital approaches to detect and track alertness in workplace settings, through the use of statistical analyses of speech patterns. There is scope to extend the application of this technology beyond shift workers, considered to be at most risk for reduced alertness at work, to wider occupational settings. In addition, the inclusion of language-based metrics such as grammar and syntax may enable the extension of the tool's use to groups with challenged language function e.g. individuals with dementia, schizophrenia or autism. The development of this novel approach to warning employees/employers of impaired performance aims to safeguard the Australian workforce from compromised safety and efficiency risks. The project aligns with the National Priority on effective technologies to manage their own health care.					

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FT220100319	**Unravelling how liquids wet surfaces with new dynamic measurements**	203,510.00	203,540.00	203,040.00	213,210.00	823,300.00
Berry, Dr Joseph D	This project aims to transform our understanding of how liquids wet surfaces in order to provide a step-change in advanced material design. This will be achieved by developing a unifying theory of surface wetting by integrating new microscale models of dynamic wetting with new macroscale automated measurement techniques capable of rapidly generating large datasets, to determine precisely how surface chemistry and surface roughness influence wetting. Expected outcomes include predictive models of surface wetting across multiple scales, and robust high-throughput measurement methods informing optimal design of next-generation materials for all applications where liquids and surfaces interact.					
	National Interest Test Statement					
	This project in the domain of advanced material design will develop new models and efficient measurement methods to determine precisely how surface chemistry and roughness influence the ability of a liquid to spread over a surface. Project outcomes will include the provision of tools developed to assist Australian researchers in industry and academia to make better decisions faster when designing materials for a broad range of applications where liquids interact with surfaces. Example applications of the resulting tools are in the creation of cleaner and more efficient solar panel materials, the development of cheaper and more environmentally friendly paints and pesticides, and in the transport sector their adoption will help to reduce fuel costs and inefficiencies due to biofouling on submerged ship hulls. The methods developed in the project will also create opportunities for Australian manufacturing businesses through licensing and commercialisation pathways.					
FT220100345	**Next Generation Photocatalysis for Chemical Synthesis and Manufacture**	231,775.00	231,842.00	231,842.00	231,842.00	927,301.00
Polyzos, Dr Anastasios	This project aims to discover new methods for the activation of energy demanding bonds in organic molecules as a general strategy in chemical synthesis. A key conceptual advance in this project is the development of multiphoton photoredox catalysis as a powerful tool to activate traditionally unreactive, yet abundant chemical bonds in organic molecules including C-H bonds in alkane and olefin feedstocks. With application in fields that range from fine chemical production to drug discovery, the overarching aim of this research is to establish new bond activation reactions and to demonstrate translations to the invention of new pharmaceuticals, agrochemicals and advanced chemical manufacturing processes that will have societal impact.					
	National Interest Test Statement					
	This project will contribute to Australia's future prosperity by addressing existing challenges in chemical manufacture and molecular discovery. Transformative technologies are essential to the future generation chemical products that will meet growing society demands and provide economic benefit to industry. The new photocatalytic technologies in this proposal will allow the generation of new materials in the pharmaceutical, agrochemical, and fine chemicals sector beyond the reach of current technologies. Moreover, the application of flow chemistry technologies will deliver advanced and sustainable chemical manufacturing processes, that are critical to Australia's national interest in sovereign manufacturing. This proposal will build new knowledge capacity through the training of STEM graduates with skills that will lead to a high-quality workforce in academic and industrial chemical sciences.					
FT220100418	**The Blue Economy and International Law**	270,000.00	270,000.00	270,000.00	270,000.00	1,080,000.00
Young, Prof Margaret A	States, regional bodies and international financial institutions are seeking new economic opportunities from the sea. Both national and globally-shared ocean resources are marked for the pandemic recovery amidst escalating threats including marine plastics pollution, climate change and overfishing. The Blue Economy promises to deliver growth that aligns with environmental and human welfare goals. This project aims to provide the first detailed analysis of the laws and practices relating to the Blue Economy. It will investigate treaties and other instruments from trade, development, fisheries, climate and environmental organisations. The findings will provide guidance to Australia, the Indo-Pacific region and the international community.					

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	National Interest Test Statement The Blue Economy refers to the sustainable use of ocean resources for economic growth and improved livelihoods while preserving a healthy ocean ecosystem. This project will provide new knowledge on how international law addresses the Blue Economy and associated challenges such as marine biodiversity conservation, plastics pollution and overfishing. Project outcomes will include the first detailed analysis of treaties and laws that guide how the world uses its oceans. This will help to identify requirements for new trade and development arrangements that impact the fisheries sector and management of marine and coastal resources. Outcomes will inform policy and regulatory responses to social, environmental and cultural uses of the oceans, with immediate benefits for Australia in how to safeguard its Blue Economy resources. Dissemination of findings will be targeted through government and community organisations to facilitate cooperation relating to law of the sea, trade law and environmental law.					
FT220100493 Ruppanner, A/Prof Leah E	**The Consequences of the Mental Load for Australian Families** This project aims to investigate the mental load; a structure of household work that combines cognitive and emotional labour. While there are theoretical understandings of the mental load, there is a dearth of quantitative research. This project expects to develop a consistent and reliable measure of the mental load and an understanding of its impacts on Australian families. The expected outcomes of the project include a comprehensive measurement of the mental load both in Australia and abroad. This will allow for the development of policy alleviating its impacts on caregivers, particularly mothers, and assist workplaces and Government in incorporating women into employment to reduce gender inequality.	254,000.00	254,000.00	254,000.00	254,000.00	1,016,000.00
	National Interest Test Statement Mental load refers to the cognitive and emotional effort in managing one's work, relationships and household. Mental load is not directly about physical tasks but about what is required for individuals to manage them. This project will develop a world-first reliable measure of mental load based on rigorous qualitative research with Australian families. In family settings, the division of household work creates a mental load that disproportionately falls to women, significantly contributes to work-family conflict, and has a major impact on businesses. By building a comprehensive measure of mental load, project outcomes will provide a strong evidence base for policy changes that can reduce mental health issues associated with burnout. Targetted dissemination of findings to government and businesses will support the development of policies and practices to alleviate the impact of mental load on caregivers, particularly mothers, and assist workplaces and government in addressing the gender employment gap.					
FT220100629 Duchene, Dr Sebastian	**Data-driven phylodynamics: molecular evolution to epidemiology** This project aims to uncover how different environmental and ecological variables drive the emergence of pathogens with increased transmissibility or virulence, known as variants. This will be achieved through extensive analyses of virus genome data. This project expects to generate new knowledge in the field of pathogen evolution using novel data-driven statistical techniques for genomic analyses. Expected outcomes of this project are a new understanding of the circumstances under which pathogen variants emerge and a suite of statistical tools to exploit the vast genome data available. This should provide significant benefits by generating new knowledge with the potential to improve biosecurity, agriculture, and heath.	163,598.00	193,598.00	193,598.00	193,598.00	744,392.00
	National Interest Test Statement Microbes that cause disease can undergo genetic variation leading to more serious disease effects and greater infectivity. There are now vast collections of information about the genetic codes of infection disease microbes, but current mathematical techniques are inadequate to extract the critical information relevant to better control and manage infectious disease. This project will develop new statistical and computational techniques to identify factors that drive changes in virulence or transmissibility of an infectious pathogen. Project outcomes will not only expand fundamental biological knowledge but will also be a basis for future applications in analysing transmission of animal and human infectious diseases and hence contribute to improved national disease surveillance and response. The Fellowship results will be disseminated through open access publication and communication pathways. Where appropriate, translation of the research will be aligned with institutional commercialisation pathways and facilitated through our links to animal and human infectious disease sectors.					

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FT220100650	**Improving the performance of Australian social insurance schemes**	227,833.00	213,751.00	212,846.00	225,156.00	879,586.00
Thompson, Dr Jason H	Applying methods from computational social science, this project aims to develop a novel, multi-level modeling framework to assist transport injury, workplace injury and disability insurance schemes consistently achieve and maintain standards of high performance as recognised by international benchmarks. By creating a virtual laboratory for policy-makers and scheme managers, it expects to generate a comprehensive understanding of mechanisms driving insurance scheme performance, enabling comparison of anticipated outcomes in response to legislative changes, policy changes and management decisions. The project aims to help schemes avoid human and financial failure, benefitting people with injuries and disabilities while reducing scheme costs.					
	National Interest Test Statement Social insurance schemes, such as injury and disability insurance, are expensive and their costs must be reasonably controlled, but they are also vital to the operation of critical social systems that citizens rely upon daily. Without affordable insurance, individuals and businesses could not work or engage in trade, transport, or broader society without having legitimate concerns about the potential consequences of accidents or other misfortune. Through developing new approaches to modelling insurance scheme performance, this project will provide data on ways to achieve and maintain the financial sustainability of these schemes. Project findings contribute to Australia's national interest through identifying ways of maintaining the viability of social insurance systems. Translation of these findings to promote adoption by policy and regulatory sectors has the potential to benefit Australian economic, social and commercial activity across the transport sector and workplaces.					
	The University of Melbourne	2,133,995.00	2,162,360.00	2,154,605.00	2,168,823.00	8,619,783.00
	Victoria	7,368,561.00	7,324,123.00	7,330,120.00	7,191,739.00	29,214,543.00

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Western Australia						
Curtin University						
FT220100566	**Lifting the lid on a supercontinent**	264,481.00	264,481.00	264,481.00	245,481.00	1,038,924.00
Clark, Prof Chris F	This project will reveal the time-integrated growth and collapse of a supercontinental orogen in order to advance knowledge on the influence that mountain-building events have on the cycling of materials between the major near surface Earth reservoirs. Given that this cycling is key to understanding deep-time climate and the formation of mineral resources the outcomes of this study will have important economic benefits for targeting mineral resources and placing the geochemical proxies for the deep-time climate in context.					
	National Interest Test Statement					
	This project will investigate the history of an ancient mountain range, from formation to destruction, and quantify the physical and chemical processes that operate during this evolution. Mountains form some of the most dramatic scenery on Earth but also impact many aspects of human well-being. Changes in surface elevation during their growth and collapse directly influence weather patterns, and associated weathering and erosion drive changes in ocean and atmospheric chemistry. Less well understood are profound changes deep inside evolving mountain belts that redistribute materials and concentrate metals to form ore deposits. Much of our wealth in Australia derives from ore bodies formed inside ancient mountain belts and the results of this project will increase our understanding of how, why, and where these ore bodies form. Incorporation of this understanding into the strategies used in mineral exploration will aid the discovery of new ore deposits and help meet increased demand for critical metals as the world adopts green technologies.					
FT220100792	**Unlocking secrets of fertility restoration for hybrid breeding in crops**	200,598.00	181,898.00	201,348.00	182,098.00	765,942.00
Melonek, Dr Joanna A	Hybrid varieties give higher and more stable yields than conventional lines, but a cost-effective system to make hybrid seed on a commercial scale is still missing for economically important crops like wheat or barley. By elucidating the mode of action of a new type of restorer gene plus exploiting ancient or exotic wheat and barley collections this project will reveal aspects of largely understudied mechanisms underlying fertility restoration in wheat and barley. The expected outcomes of the proposed research have the potential to deliver new tools for hybrid seed production programs in wheat and barley. Higher and more stable yields from hybrids will ensure food security in the face of an uncertain climate and growing human population.					
	National Interest Test Statement					
	Hybrid crops give higher and more stable yields so hybrids are in widespread use for genetically simpler crops like corn and canola. In Australia, wheat and barley dominate our economy and yields oscillate unpredictably. The genetic complexity of wheat and barley has stymied development of hybrids. This project will provide the new tools needed to enable large-scale hybrid seed production for wheat and barley. Hybrids can generate an immediate jump in yield of up to 20% making the economic benefits of hybrid varieties tailored to the Australian climate substantial. The discoveries will be relevant for other cereals that Australia exports such as sorghum. Higher and sustainable yields will provide social benefits by guaranteeing better food and market security. This project will also strengthen collaborative activities between major research institutes within Australia and with major crop breeding efforts in Europe.					
	Curtin University	465,079.00	446,379.00	465,829.00	427,579.00	1,804,866.00
	Western Australia	465,079.00	446,379.00	465,829.00	427,579.00	1,804,866.00
		23,595,058.00	**23,693,181.00**	**23,741,035.00**	**23,220,562.00**	**94,249,836.00**

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