Minister's Approval for Discovery Early Career Researcher Award for Funding Commencing in 2021 Schedule

Approved Organisation, Approved Research Program Leader of Approved Research Program		Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
Australian Capital Territory						
The Australian National University						
DE210100043 Foster, Dr Claire N	This project aims to investigate the functional role of native and introduced herbivores in forest ecosystems using a powerful, highly replicated, herbivore exclosure experiment. This project expects to create new knowledge of the effects of mammalian herbivores, particularly kangaroos and invasive deer, on forest plants, soils and productivity. Expected outcomes include fundamental insights into above and belowground interactions in forests, and an enhanced capacity to predict effects of changing herbivore populations across environmental gradients, and following bushfire. This should produce significant benefits for forest management in Australia, allowing informed, targeted, and pre-emptive management of invasive herbivore populations.	75,500.00	151,500.00	151,500.00	75,500.00	454,000.00
	National Interest Test Statement Australia's forest ecosystems provide critical environmental services, including water filtration, biodiversity conservation, carbon storage and timber production. In recent decades, populations of native herbivores, such as kangaroos, and feral herbivores, like deer have increased in many forest ecosystems. High herbivore densities may have substantial ecological impacts, particularly in forests recovering from fire. However, current knowledge is insufficient to predict when and where negative outcomes may occur. This project will investigate the impacts of deer and kangaroos on forest plants, soils, and productivity. By examining a diversity of forest ecosystems, this project aims to improve capacity to predict herbivore effects on ecosystem function. This project will establish a new, collaborative, cross-ecosystem network, adding value to existing research investment, while delivering research outcomes directly to end users. Outcomes of this project will allow more targeted, strategic management of herbivore populations, with direct benefits for the environmental and economic values of forests.					
DE210100065 Norcott, Dr Philip L	Magnetic resonance techniques (such as MRI scans) suffer from an inherent insensitivity problem. In medical imaging, this can hamper diagnosis and mean long scan times for patients. This project aims to chemically develop catalysts which dramatically increase sensitivity, producing a signal that is thousands of times more visible. This project is significant as these catalysts can turn common, harmless molecules in the body - even water - into visible tracers. The expected outcomes of this project include the synthesis and understanding of these catalysts which will be chemically fine-tuned to maximise their effectiveness. Potential benefits include translation to MRI applications to improve diagnosis and treatment, or chemical monitoring.	71,143.00	142,286.00	140,761.00	69,618.00	423,808.00
	National Interest Test Statement One of the most prominent uses of magnetic resonance is for clinical imaging (MRI), essential for diagnosis and treatment. This research project focuses on an untapped method to improve magnetic resonance techniques. It will develop a process to achieve dramatic increases in the sensitivity of existing MRIs whilst simultaneously reducing the scanning time, with little to no modification to current setups. The results will ultimately have the potential to be transferred into these clinical contexts, increasing throughput and efficiency and providing social and health benefits to the Australian community. This technology would be applicable to all magnetic resonance applications, not just medical. Uptake of this technology in preexisting industrial processes will extend the economic and commercial benefit to Australian manufacturing and business. Inventing this process in Australia would generate commercial benefits through application in hospitals and process plants on a global scale, making Australia a world leader in this technology and providing an opportunity for business and innovation to work together.					
DE210100087 Payne, Dr Collin F	This project aims to investigate trends, determinants, and inequalities in healthy longevity in Australia. By identifying inequalities in later-life health and the drivers of healthy longevity, this project addresses a pressing issue facing Australia and other ageing populations. The project is expected to generate the first systematic evidence-base on healthy longevity in Australia, and seeks to explore how trends in later-life health in Australia fit within our global region. Intended outcomes of this project include improved health interventions and more targeted, effective, and equitable health system planning. The anticipated benefit is to improve healthy longevity among older Australians and reduce health inequalities.	69,638.00	138,327.50	143,059.00	74,369.50	425,394.00

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	National Interest Test Statement Healthy longevity is critical for Australia's ageing population. However there is growing inequality between those who enjoy later-life health, and those who experience age-related illness and disease. Australian healthcare systems do not have the data they need to plan targeted, effective and equitable services for the future. This project will analyse long-term data from Australia to explore trends in the health of successive generations of older Australians, providing improved information for planning future demand for health services, the age pension, and aged care. New methods will be developed to identify the diseases leading to health inequalities among Australia's older population, providing policymakers with clear insight on the most high-priority conditions to target with interventions. The findings from this research are expected to directly contribute to more equitable health-system planning, and ultimately help to reduce inequalities in health and longevity among older adults.					
DE210100249 Yap, Dr Mandy L	This project aims to demonstrate how Indigenous peoples can contribute to our understanding of and production of indicators to monitor sustainable development. Working with Indigenous communities in Australia and Indonesia as equal partners, the project hopes to address a significant gap in developing innovative methodologies which weaves Indigenous and Western knowledge to produce policy-relevant research. Expected outcomes of this project include a set of sustainable development indicators that embed Indigenous worldviews and in a manner that policymakers can utilise. This should provide significant benefits to Indigenous communities in Australia and internationally through enhanced capacity in Indigenous policy design and evaluation.	75,738.00	150,667.00	152,019.50	77,090.50	455,515.00
	National Interest Test Statement As we enter a challenging decade, Australia has the opportunity to lead by example through charting a path to transform the relationship between Australia's First Peoples and the nation state. The United Nations Declaration on the Rights of Indigenous Peoples has outlined the necessity to recognise expressions of Indigenous self-determination, which includes the right to pursue alternative development pathways. Yet, the process for achieving this and the shape it would take remain unclear. Drawing on equal research partnerships with Indigenous communities in Australia and Indonesia, this project will generate important new insights into achieving sustainable development that is framed and measured through Indigenous peoples' perspectives. These insights and methodology will contribute to the longer term social and economic wellbeing of Indigenous Australians by shifting the Indigenous policy debate from a deficit dialogue to one that is strength-based and locally driven, co-creating Australia's future through shared decision-making.					
DE210100323 Zhang, Dr Xiaoxiao	This project aims to engineer disease resistance in crops to dangerous fungal pathogens. The strategy is to exploit our knowledge of the plant immune system using structural biology and directed evolution of natural resistance genes, improving their ability to recognise and respond to fungal attack. Fungal pathogens cause some of the most harmful crop diseases in Australia and worldwide. The rapid evolution of fungi overcomes natural plant resistance and management of these diseases is a major challenge to agriculture. Expected outcomes of the project include engineered wheat plants with more effective disease resistance, reducing fungicide usage. This project intends to accelerate crop breeding and contribute to world food security.	72,500.00	144,000.00	143,000.00	71,500.00	431,000.00
	National Interest Test Statement Global food production is under constant threat from devastating plant fungal pathogens. Approximate 16% of worldwide annual crop production is lost due to microbial disease, of which 70-80% is caused by fungal pathogens. Control of fungal diseases using natural resistance genes provides an estimated national benefit of $1,500M/year to the production of Australian cereal crops. We hope to improve this benefit by enhancing the ability of wheat to recognise and respond to fungal pathogens. The intended outcome of this project is to increase the diversity and number of resistance genes available to plant breeders for crop improvement, providing significant economic benefits in terms of agricultural productivity and generation of royalties from seed production. National crops would be better protected with savings in pesticide usage, helping to protect the environment.					
DE210100466 Chan, Dr Kai Xun	This project aims to fill a critical knowledge gap in how photosynthesis, chloroplast signals, metabolism and cell specialisation are coordinated for stress acclimation in plants. It aims to dissect the complex interactions between a) cellular distress signals produced by chloroplasts with b) reactive radicals and c) plant metabolism during heat stress. It expects to provide the first insights into chloroplast signalling critical for heat-tolerant C4 photosynthesis which is active in two specialised leaf cell types in cereals such as maize and sorghum. Expected outcomes include an unprecedented cell-level resolution map of chloroplast signalling, which will benefit the engineering of improved photosynthesis into crops.	73,880.50	149,753.50	139,931.00	64,058.00	427,623.00

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	National Interest Test Statement Heat stress decreases crop productivity by up to 80% in important broad-acre crops such as wheat and canola, costing Australian agriculture $1.1 billion annually. Between 20-36% of the heat-induced yield loss is due to impaired photosynthesis. With conditions in Australia forecast to become hotter and drier during the growing season of these crops, this project is timely and strategic. This project will provide critical insights into the regulatory molecular framework of heat-tolerant photosynthesis currently only found in a minority of land plants such as sorghum and sugarcane, which are themselves important Australian crops. Results from this project will facilitate the fine-tuning and engineering of this specialised heat-tolerant photosynthetic mechanism into major cereals including wheat and rice. With a 5% increase in photosynthetic efficiency projected to enable yield rescue worth $500 million annually, this research contributes to safeguarding the viability of Australian agriculture and food security against environmental challenges.					
DE210100486 Monson, Dr Rebecca J	This project aims to investigate the strategies that Pacific women use to challenge gender inequality, and improve understanding of the pathways to justice in Pacific legal systems. Using an innovative socio-legal approach, the project will collect, analyse and disseminate data on the strategies used by women to advocate for stronger property rights, and develop a framework for understanding those strategies. Expected outcomes include an improved empirical and conceptual basis for development organisations to design and implement gender equality programs. This should provide significant benefits including enhanced understanding of women's engagement with legal systems, and better-informed and more effective development assistance.	72,270.50	146,059.50	149,616.50	75,827.50	443,774.00
	National Interest Test Statement The project aims to contribute to Australia's national interest in at least four ways. Firstly, Australia is the leading aid donor in the Pacific region, with significant investments in advancing the rights of Pacific women. The project will strengthen the evidence base underpinning the design and implementation of this development assistance, with the potential to improve both the economic efficiency and social effectiveness of Australia's gender equality work. Secondly, the project's focus on gender inequality and property rights has the potential to contribute to sustainable economic growth and poverty reduction, with economic and social benefits for both Australia and recipient countries. Thirdly, the project addresses key priorities of the international community as expressed in the Sustainable Development Goals, and supports Australia's stated objective of providing global leadership in the gender equality field. Fourth, the project has the potential to deliver cultural benefits by increasing shared understanding between Australian and Pacific peoples.					
DE210100496 Nisa, Dr Eva F	This project aims to advance understanding of how halal standardisation has been reimagined in the context of global Muslim cultural diversity. It investigates the halal cultural economy—finance, food, travel, fashion, media, and cosmetics—in Malaysia and Indonesia. Using innovative interdisciplinary approaches, in particular anthropology and Islamic textual analysis, this project expects to generate a new level of understanding of halal industries. Expected outcomes include identifying major players and unpacking local cultural responses to the global move to homogenise halal practices. Australia is the world's second-largest halal food exporter: this research should benefit its businesses' expansion into contemporary halal industries.	74,414.50	149,550.00	148,731.00	73,595.50	446,291.00
	National Interest Test Statement Deepening understanding of current trends in halal industries will contribute to Australia's economic, commercial, social and cultural interests. Australia is a major player in the global halal economy as evidenced by: a) The Global Islamic Economy index ranked Australia the fourth-largest halal food industry in 2019; b) Indonesia and Malaysia are major trade partners for Australia. In 2019, Indonesia was Australia's largest trade partner, especially for halal meat and live animals; c) Domestically, Australia has witnessed the growth of the domestic halal market due to an increase in its Muslim population. The 2016 census recorded that Muslims constituted 2.6% of the total Australian population, an increase of over 15% from the previous census. The proposed research will benefit stakeholders seeking to understand the interplay between the expansion of halal goods in Australia and the region. It will contribute to educating the public, overcoming divisiveness relating to misconceptions of halal industries, building mutual understandings and social cohesiveness between Muslim minorities and the majority.					
DE210100508 Tang, Dr Matthew F	Unlike traditional theories of visual perception, recent evidence suggests what a person expects can fundamentally change how they see the world. However, the neuronal mechanisms which would allow expectation to affect perception are poorly understood. This project will use revolutionary recording techniques to determine how multiple brain regions interact to use predictions about the future to change visual processing. The expected outcome is understanding a fundamental theory of brain function for the first time at the level of single neurons. This project will contribute to a new understanding of central theories of how the brain allows us to see which will significantly enhance basic vision science.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00

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	National Interest Test Statement This project will enhance Australia's research capacity and technological innovation by investigating how prediction affects how the brain processes sensory information. This project uses revolutionary technologies to record large populations of neurons across the brain and determines how predictions about the future change the way the brain works. This project will determine whether the brain works in the manner proposed by predictive coding theory which is the only existing theory which attempts to all brain functions. A number of clinical conditions, such as schizophrenia and anxiety, have been linked with deficits in predictive coding, however the underlying neural circuitry is poorly understood. The basic science outcomes also have the possibility of significantly enhancing artificial intelligence by providing a new biologically inspired framework that uses predictions about the future.					
DE210100535 Guang, Dr Qiang	The project aims to characterise the geometric structure of minimal surfaces in the variational theory and classify singularities of mean curvature flow. Minimal surfaces are mathematical models of soap films, and their time-varying analogue is mean curvature flow, a dynamic process by which a surface flows to decrease its area as quickly as possible. As a central topic in geometric analysis, the theory of minimal surfaces and mean curvature flow has proven to be a powerful and essential tool in mathematics. The project expects to generate new and significant results in minimal surfaces and singularity analysis of mean curvature flow and enhance potential applications in related disciplines such as computer vision and probability.	56,658.00	113,616.00	113,616.00	56,658.00	340,548.00
	National Interest Test Statement The Australian economy and society will greatly benefit from this project's contribution to cutting-edge knowledge in a major area of mathematics as well as its industrial applications. This project will advance our understanding of the structure, formation, and stability of surfaces, boundaries and interfaces, and will generate accurate mathematical models supporting more efficient and robust algorithms in industrial applications such as image processing and computer vision. This project undertakes fundamental research in geometric analysis, a rapidly advancing field of modern mathematics which seeks to understand the geometric structure of objects arising naturally in many areas of science, technology, and economics. The methods of geometric analysis have applications in medical imaging which is vital for diagnosing and treating diseases, facial recognition, computer vision in artificial intelligence (used in autonomous vehicles), and the design of optimal structures in applications as diverse as architecture and nanotechnology.					
DE210100549 Bonnet, Dr Timothée	This project aims to provide the first test of whether the rate of adaptative genetic evolution has changed in the recent decades, to quantify how much recent genetic evolution helps animal populations survive, and to increase the ability to study on-going genetic evolution in Australian wildlife. The project is of major significance as many species are currently threatened, or invading, due to rapid environmental changes, in particular climate change. The anticipated outcome of the project is to deliver new methods, establish a network of international and national collaborators and improve the ability to measure and to forecast how Australian animals adapt to rapidly changing environments.	76,514.00	143,914.00	132,150.00	64,750.00	417,328.00
	National Interest Test Statement This research aims to quantify current genetic evolution and how it contributes to the survival of wild animals in the face of fast environmental changes. At a time when Australian biodiversity is under pressure from numerous threats, this research will produce data, methods and conclusions that will assist in managing populations in the face of environmental change, in particular climate. This research will put Australian researchers at the centre of an ambitious international collaboration, strengthen Australian expertise on emerging cutting-edge methods and contribute to the appeal of the tertiary education to international students. The project will build capacity to measure and predict the impact of environmental changes on Australian wildlife and directly inform the conservation of charismatic Australian species that are currently declining. Beyond conservation, further potential benefits include predictions of when genetic adaptation causes agricultural pest outbreaks, and identifying which species have more adaptive potential in forestries and fisheries facing climate change.					
DE210100550 Eichholz, Dr Johannes M	This project aims to investigate fundamental noise in optical coatings, a limiting factor for state-of-the-art astronomical observatories, global timing standards, and photonics applications. Gravitational wave detectors, marvels of precision engineering that have produced ground-breaking discoveries in fundamental science, are particularly afflicted by coating noise. The proposed experiment plans to operate at cryogenic temperatures with unprecedented sensitivity to conduct feasibility studies of deposition methods, coating materials, and layer structures. The goal is to deploy innovative methods to develop Australian-made optical coatings with superior performance and merit for the most demanding scientific and industrial applications.	77,143.00	154,152.00	151,920.50	74,911.50	458,127.00

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	National Interest Test Statement Optical coatings play a central role in many high-tech industries that drive modern economies, e.g. the rapidly growing photonics and space sectors, laser fabrication, and communication. This project seeks to investigate optical and mechanical loss mechanisms in high-performance coating materials and layer structures that limit the accuracy and power handling of precision measurement devices. Its goal is to develop Australian-made novel coatings with superior stability and thermal tolerance, which will pave the way for advancements in challenging industrial and defence applications such as frequency metrology, optical clocks (GPS), Lidar, airborne substance trace detection, and quantum computing. It will also make optics more viable for use in extreme environments, such as high-power lasers, environmental monitoring from orbit, and ground-to-satellite communications. This project contributes to the high-performance material research challenge in the advanced manufacturing envelope of Australia's science and research priorities and gives Australia cutting-edge expertise for continued economic prosperity.					
DE210100679 Kruk, Dr Sergey S	The project aims to develop approaches to control propagation of light in nonreciprocal ways, similar to ways we control directions of electric currents with semiconductor diodes and transistors. Nonreciprocal behaviour of light is difficult to achieve, and it is currently limited to relatively large optical systems, which represents a road block for further miniaturisation and integration of optical devices. Expected outcomes of this project include first demonstrations of a radical miniaturisation of nonreciprocal optical components to the nanoscale. The outcomes should enrich our fundamental knowledge and assist the advancement of vital technologies such as integrated optical circuitry and communication infrastructure.	73,462.50	146,925.00	144,925.00	71,462.50	436,775.00
	National Interest Test Statement We live in an information-driven society. Our exponentially growing data exchange has well-surpassed a zetta-byte per year, that’s a number with 21 zeros – a remarkable achievement of information and communication technologies (ICT). The ICT revolution started from miniaturisation of nonreciprocal electronics, semiconductor diodes and transistors. The key to the next phase of social changes brought about by the ICT is to replace electronics with photonics. Australia is progressing through the first step of this transition with the NBN program by replacing copper wires transmitting electrons with optical fibres transmitting photons. Next steps are to replace electrons with photons inside devices, their individual integrated circuits, and ultimately inside microchips. This creates a demand for miniaturisation of photonic components, with nonreciprocal components being among the most challenging to miniaturise. This project will take nonreciprocal photonics all the way to the nanoscale. The project aims to demonstrate the first advanced manufacturing technology for nanophotonic nonreciprocal components.					
DE210100749 Constantinou, Dr Navid	Climate projections require simulations with ocean-climate models for hundreds of years. Computational resources limit the resolution of our models for such long runs, meaning that some key physical processes remain unresolved and must be parameterised. This project uses machine learning to find new parameterisations for unresolved ocean processes. These new parameterisations will be implemented into computationally cheaper coarse-resolution ocean models, thereby enhancing these models' representation of the ocean circulation. This project expects to reveal the dynamics of unresolved processes, to improve the accuracy of climate projections and to provide a proof-of-concept for how machine learning can be used in ocean and climate science.	70,627.00	143,599.00	146,388.00	73,416.00	434,030.00
	National Interest Test Statement This project proposes to use the latest of machine learning algorithms to enhance the accuracy of Australia's operational ocean and climate models. Machine learning algorithms have revolutionised our modern life but still have not yet been implemented in ocean or climate models. This project seeks the opportunity to bring Australia at the bleeding edge of climate modelling by providing the proof-of-concept for how machine learning algorithms can be incorporated in global ocean and climate models. The proposed approach is expected to revolutionise the accuracy of global ocean and climate models, enabling much better climate projections. Thus, the proposed project will contribute to the efforts of both the Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organisation (CSIRO), by improving the accuracy of their operational models. In addition, this project is anticipated to significantly benefit the community by enhancing Australia’s ability to predict and adapt effectively to future climatic changes.					
DE210101235 Teixeira, Dr João C	This project aims to provide a detailed understanding on the remarkably complex encounters between archaic and modern human populations in Island Southeast Asia, New Guinea and Australia during the Pleistocene. The project plans to provide the largest collection of human genetic diversity from this vast geographical region and significantly advance current knowledge on one of the most intriguing questions in human evolution. These insights are expected to bring important social and cultural benefits for Australia by unveiling the singularly deep genetic history of Aboriginal Australians, including their ancient connection to indigenous communities from Indonesia and New Guinea that extends back to when people first arrived in Australia.	69,150.00	143,600.00	143,100.00	68,650.00	424,500.00

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	National Interest Test Statement This project is of significant social and cultural importance to Aboriginal Australian communities as it will shed light on currently unknown chapters of their unique and remarkable evolutionary history. The project will help promoting public recognition and understanding of Aboriginal history and culture in Australia and abroad, in particular their deep evolutionary connection to indigenous communities in New Guinea and Indonesia. Specifically, this project will address one of the most outstanding questions in human evolution by generating an impressive collection of genetic data and implementing state-of-the-art analytical methods to detail the encounters between modern and archaic humans during the remarkable journey that took people from Africa and into Australia ~60,000 years ago. The project will trace the timing and geographical location of mixing events between the ancestors of Aboriginal Australians and archaic human groups inhabiting Island Southeast Asia by the time anatomically modern humans first arrived in the region.					
DE210101721 Howes, Dr Hilary S	This project aims to produce the first detailed investigation of the acquisition of Indigenous human remains from Australia, New Zealand and the broader Pacific by the Russian Empire during the long 19th century. It expects to generate new knowledge about Imperial Russia's scientific networks, anthropological collections and underlying intellectual traditions. Expected outcomes include a better understanding of Russian perceptions of Indigenous peoples and the development of a new way of writing histories about the collecting of Indigenous human remains. Working directly with affected communities, this project should provide significant benefits to Indigenous peoples seeking the return of their ancestors' remains from overseas institutions.	72,032.00	145,126.00	142,400.50	69,306.50	428,865.00
	National Interest Test Statement Understanding the past is an essential dimension of reconciliation between Indigenous and non-Indigenous peoples. The Australian Government recognises the relationship between repatriation, healing, and reconciliation. Yet without evidence of early collecting efforts of our Indigenous heritage by overseas countries, Indigenous repatriation claims cannot be submitted to the overseas institutions that now hold their heritage. Working directly with affected communities and undertaking the first in-depth investigation of Imperial Russia's collecting of Indigenous human remains, the project will produce significant new knowledge about overseas collections and reveal undiscovered Australian Indigenous histories. It will develop new ways of writing about Australian Indigenous remains in museum contexts, privileging Indigenous biography over histories of collectors. Finally, it will improve the quality of evidence available to historians, policymakers, and the wider Indigenous population in Australia and internationally in order to enable their repatriation negotiations and long-term reconciliation efforts.					
DE210101827 Lester, Dr Eve M	This project aims to establish a socio-legal account of the arrival of Cambodian ‘boat people’ in Australia from 1989 to the present. The project expects to shed new light on these events by using an innovative blend of research methods. Interweaving archival and oral history sources, it seeks both to describe institutional responses to these events and show how participants experienced and remember them. Expected outcomes include enhanced knowledge of the effects of asylum-related policy and the generation of international and domestic policy guidance for ensuring that such policy is historically-informed. Significant societal benefits will flow by generating new historical knowledge and understanding, and better-informed policy.	60,500.00	130,850.00	136,850.00	66,500.00	394,700.00
	National Interest Test Statement The arrival of Cambodian ‘boat people’ from 1989 was a watershed ‘moment’ in asylum-related law- and policymaking in Australia. The socio-legal dynamics that shaped responses to this ‘moment’ are crucial to explaining current approaches in this field. This will not only be the first socio-legal account of these events as a whole, but it will also be the first socio-legal account of asylum policy in Australia to interweave oral and institutional historiographical research methods. The project will uncover new knowledge about the socio-legal dynamics that shape such law and policy and their enduring impact by providing a 360-degree view of these events. It is in the interests of both Australia and the international community that asylum-related law- and policymakers have the tools that enable them to draw on such knowledge; to govern by looking back. Splicing oral and institutional historiographical research methods, the knowledge generated by this cutting-edge research will enable the development of policy guidance that promises to have global impact.					
DE210101865 Cheema, Dr Moeen H	This project aims to investigate the post-conflict criminal justice reform program in formerly Federally Administered Tribal Areas (FATA) in north-western Pakistan. It will develop a new interdisciplinary framework for studying how three categories of cases—terrorism, narcotics smuggling, murder and cyclical violence—are being handled by the criminal justice system. Expected outcomes include enhanced understanding of the social, legal and institutional factors impacting the prosecution of these crimes in former FATA. It will benefit Australian and international policymakers seeking to support the agenda to enhance state-building and rule of law reform in this region bordering Afghanistan.	73,233.00	148,461.00	150,666.00	75,438.00	447,798.00

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	National Interest Test Statement State fragility, violent extremism and political conflict remain a serious threat to peace in South and Central Asia, affecting Australia's vital security and foreign policy interests. In the 2017 Foreign Policy White Paper, the Australian Government highlighted the importance of supporting partner countries in peacebuilding, rule of law reform and the advancement of human rights in this important region. This project will benefit Australia by providing a systematic assessment of the ongoing reform of the criminal justice, policing and security architecture in north-western Pakistan, thereby informing Australia's engagement on high priority foreign policy issues such as anti-terrorism cooperation, transnational crime (including drug trafficking and people smuggling) and regional security. This project will also enhance the capacity of Australian security and development programs to assist vulnerable countries in our region in post-conflict state-building, rule of law reform, protecting human rights and preventing the recurrence of violence.					
	The Australian National University	1,291,562.00	2,596,702.50	2,584,950.00	1,279,809.50	7,753,024.00
University of Canberra						
DE210100032 Giling, Dr Darren P	This project aims to build a whole-of-ecosystem model to trace the biological capture of energy and cycling of matter as it moves through entire river catchments. It is expected to generate new knowledge about ecological responses to environmental streamflow through the novel integration of all major food-web compartments – from dissolved molecules to predatory fish – in a single framework. The expected outcome of this project is an enhanced capacity to predict the ecological consequences of future water management scenarios, facilitating more precise management of river systems. This should provide considerable benefits to the health of Australia's rivers and the contributions these ecosystems make to society, environment, and agriculture.	75,233.50	151,862.00	153,089.00	76,460.50	456,645.00
	National Interest Test Statement A specific amount of water has been legislated for use to improve the ecological condition of Australia's rivers and floodplains. The anticipated outcomes of this environmental water include healthy waterways and thriving fish populations that provide cultural, social, and economic benefits to Australian communities. For instance, recreational opportunities bring people to regional areas, whilst algal blooms and fish kills are health risks, economically harmful, and aesthetically unpleasing. How water delivery can achieve the desired environmental state is determined by an interacting set of physical, chemical and biological processes that control, for example, how much energy is captured or imported and subsequently passed up the food chain. The holistic modelling framework proposed here will advance our fundamental understanding of how these processes operate at the temporal and spatial scales that are relevant to management and policy decisions. This will aid the development of an environmental water strategy that optimises ecosystem condition and nature's survival and subsequent benefits to humans.					
DE210101881 Resnick, Asst Prof Ilyse R	This project aims to improve boys and girls' spatial reasoning in preschool (when gender differences emerge) by utilizing an activity that both genders equally access: book reading. Spatial reasoning is critical to achievement in science, technology, engineering and mathematics (STEM). This project will address disproportionate outcomes in spatial reasoning and STEM achievement, particularly among females, by identifying effective kinds of spatial learning opportunities for the preschool context. Expected outcomes include an innovative approach to improving spatial reasoning through literacy engagement. This provides significant benefits by creating pathways into STEM and informing targeted interventions.	66,362.50	135,782.50	137,332.50	67,912.50	407,390.00
	National Interest Test Statement Achievements in science, technology, engineering and mathematics (STEM) have been identified as critical for economic growth and prosperity. A key barrier to entry into STEM is spatial reasoning. The project aims to foster the requisite, foundational spatial reasoning skills in preschool so that students are better prepared to engage in STEM as they continue through their academic career. In this way, the project can have long-lasting, cascading effects by creating pathways into STEM. Traditional spatial learning opportunities include activities that girls do not access as often as boys (e.g., block play). The use of book reading is an innovative approach to engage girls, who are underrepresented in STEM, in spatial reasoning. Expected outcomes include innovative literacy-based approaches to fostering spatial reasoning, a book developed for use in the national program Early Learning STEM Australia and dissemination more broadly, and insights into how spatial reasoning develops. These findings will inform development of children's books and targeted interventions to build STEM capacity in Australia's future.					
	University of Canberra	141,596.00	287,644.50	290,421.50	144,373.00	864,035.00
	Australian Capital Territory	1,433,158.00	2,884,347.00	2,875,371.50	1,424,182.50	8,617,059.00

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(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
New South Wales						
Macquarie University						
DE210100115 Fabry, Dr Regina E	A robust sense of self is crucial for our mental wellbeing. This sense of self, philosophical research shows, is constituted by our experiences and the socio-culturally shaped stories we tell about us. However, the fundamental role of these self-narratives remains poorly understood: are they merely retrospective accounts of our experiences, or can they influence them? By analysing the biological underpinnings of the human mind and defining the core features of self-narratives, this project will lead to a novel theory about the sense of self. This theory will enhance our understanding of the power of self-narratives and has the potential to provide theoretical foundations for future applied research on the self and its disturbances.	54,933.50	109,236.00	109,112.50	54,810.00	328,092.00
	National Interest Test Statement Self-narratives make crucial contributions to a robust sense of self, which is essential for mental wellbeing. However, the characteristics of these contributions, and how they impact our experiences of ourselves and others, need to be determined. By developing a new theory of the intricate relationship between subjective experiences, narratives, and the self and by analysing how it plays out in major depressive disorder and Capgras syndrome, this project has the potential to improve our understanding of the importance of narrational competence for mental health. This may have long-term implications for applied research aiming at the improvement of intervention methods that enhance self-narrational abilities, e.g., transformative reading, creative bibliotherapy, and expressive writing. Given the high prevalence of mental disorders, with 45.5% of all Australians being affected at least once in their lifetime, and the high costs incurred by their treatment, $9.1 billion each year, these implications can contribute to individual, social, and economic benefits in the long run.					
DE210100303 Bourrat, Dr Pierrick	This project aims to solve a fundamental problem in biology, namely, how entities at one level biological organisation (e.g. single cells) transition or evolve into entities at a higher level (e.g. multicellular organisms). Although several attempts to solve this problem have been made, they are unsatisfactory because they neglect the role of inheritance during the transitions. The project will employ philosophical analysis, formal models, and ultimately experiments with bacteria to understand the role of inheritance during these evolutionary transitions. In doing so, the project will demonstrate that conceptual research by philosophers of biology can make an impactful contribution in biology and answer fundamental questions in this field.	67,750.00	143,600.00	152,850.00	77,000.00	441,200.00
	National Interest Test Statement This cutting edge interdisciplinary research will answer significant questions about inheritance, evolution and individuality. Working at the intersection of philosophy and theoretical and experimental evolutionary biology it will tackle questions such as: “How did organisms acquire the capacity to transmit their traits with a high degree of fidelity to their offspring?” The concept of individuality, central to important developments in this area, is relevant to how we treat certain diseases. For example, two of the leading causes of mortality and disease burden in Australia, diabetes and obesity, have been linked to changes in the composition of gut bacteria. An increasing number of scientists claim that these bacteria should not be regarded as independent from us but rather should be seen as forming a cohesive whole with us, that is, as part of our individuality. The question of whether such claims are justified has implications for the way we manage gut bacteria in treatment of these diseases. My framework will contribute knowledge relevant to biomedical research and the health of Australians.					
DE210101068 Tanasoca, Dr Ana	The common heritage of mankind, presently only a weakly-articulated principle of international law, postulates that some assets are valuable for all mankind and hence should be preserved for perpetuity. This project aims to provide the first systematic, unified moral framework for understanding this principle. It expects to analyse the ground and scope of cosmopolitan duties to protect assets belonging to this heritage, thereby contributing to important philosophical debates on intergenerational justice, cosmopolitanism, climate change, and humanitarian intervention. Its expected outcomes include practical guidance to policymakers and stakeholders in reshaping global governance around this principle.	58,383.50	119,461.00	128,959.50	67,882.00	374,686.00

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	National Interest Test Statement The preservation of some natural and cultural assets is crucial to the survival and flourishing of human civilization. Climate change, military conflict, and extremist politics are all major threats to cultural and natural assets of utmost value around the world. The terrible fires in Australia threated not only its cultural and natural patrimony but the world's, burning Gondwana rainforests on UNESCO's World Heritage register. Australia has an environmental, social, and cultural interest in preserving these assets, as well as in the preservation of other such assets located elsewhere. Preservation of this patrimony is owed not only to current citizens but also to future generations. In providing a systematic philosophical analysis of the common heritage of mankind, this project will advance these national interests. It will provide a better understanding of why Australia should dedicate its resources to securing a culturally and naturally rich environment, not just inside its borders but beyond, providing guidelines for reforms of international law for Australia to promote.					
DE210101458 Zhang, Dr Xuyun	Anomaly detection, aiming to identify anomalous but insightful patterns in data mining, is an important big data analytics technique. The nature of big data requires a detection method that can handle fast-evolving data of diverse types. However, existing methods suffer from either high computational cost or low detection performance. This project aims to develop a detection framework to advance detection performance and efficiency, based on a novel deep learning model called deep isolation forest which is different from the traditional artificial neural network based models. The outcome will bring huge benefits to various applications such as real-time predictive maintenance in smart manufacturing, and intrusion detection in cybersecurity.	56,158.00	124,568.50	137,412.50	69,002.00	387,141.00
	National Interest Test Statement The project will deliver fundamental impacts to many sectors including cybersecurity, manufacturing, and environment. It aligns well with the national Science and Research Priority of Cybersecurity. The developed novel anomaly detection techniques will support the nation's cybersecurity by overcoming the challenge of "discovery and understanding of vulnerabilities, threats and their impacts, enabling improved risk-based decision making, resilience and effective responses to cyber intrusions and attacks". The success of the project will promote the performance and efficiency of cyber intrusion and attacks detection systems. National cybersecurity will be lifted to a higher level by integrating the proposed framework into existing intrusion detection systems. Another application domain is smart manufacturing. Manufacturing will benefit from predictive maintenance tools developed based on our framework, as they can save a huge amount of cost incurred by system faults and failures. This will contribute to achieving smart manufacturing for PM's Industry 4.0 Taskforce and accelerating Australia's economic growth.					
	Macquarie University	237,225.00	496,865.50	528,334.50	268,694.00	1,531,119.00
The University of New South Wales						
DE210100274 Li, Dr Chaojie	This project aims to develop a breakthrough framework for decision-focused learning by integrating explainable graph neural networks and efficient computational methods. It expects to create new methodologies of graph representation learning for unlocking data insight with spatiotemporal knowledge while to build new accelerated optimisation theories for speeding up decision-focused learning model. The expected outcomes will advance big spatiotemporal data analytics and nonlinear optimisation theory for solving decision-making tasks towards a future energy system. This should promote the Australian power industry transition to a sustainable future grid based on a digitalisation approach to efficient energy management against climate changes.	65,962.50	134,425.00	141,875.00	73,412.50	415,675.00
	National Interest Test Statement Climate change is leading to a wide range of increasingly severe impacts on every Australian, such as ever-stronger storms and catastrophic bushfires. Addressing climate change requires new technologies to reduce emissions and prepare for unavoidable consequences. The development of cutting-edge technologies for a sustainable Australian energy future in this project will accelerate the digitalisation of the Australian power industry. Specifically, the outcome of the applied scientific research in this project includes a suite of new models for future electrical grids that automatically determine, for any given instant in time, the optimal output of a large number of grid-connected electricity generators (e.g. solar photovoltaics or wind turbines), to meet the system load, at the lowest possible cost, subject to energy transmission, operational and storage constraints. The increasing integration of demand response and renewable energy presents challenging issues for Australian energy policy makers and electricity market regulators, which are addressed here using an efficient graph neural network approach.					

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DE210100291 Wang, Dr Anna	For life to have arisen, simple self-assembled chemicals must have performed key life-like functions. This project aims to generate new knowledge in the fields of soft condensed matter physics and astrobiology by understanding how primitive life could have obtained nutrients and completed “cell” division without proteins. This ambitious goal is expected to not only contribute towards understanding the origins of life, one of the grand challenges in science, but also to elucidate principles in membrane biophysics and self-assembly. The fundamental scientific findings will be applied to making responsive capsules that can confer advanced functionalities to soft materials. Several international collaborations are anticipated. **National Interest Test Statement** While manufacturing can build structures such as cars and microchips, the stepwise processes required are laborious and time-consuming. This project takes inspiration from biology: life got started by true ‘self-assembly’, and therefore understanding how life made the transition from simple chemicals to biology can completely alter how we manufacture things. This project aims to take a cost-effective and biocompatible material - fatty acids - and build artificial cells with them. Fatty acids are an extremely abundant industrial byproduct and found not only in food, personal care products and our skin, but also in meteorites. Successfully harnessing the self-assembly and mechanical properties of fatty acids to achieve the project goals will contribute towards understanding the origins of life, one of humanity’s greatest mysteries, and thus generate a lot of public interest. This project will also apply the knowledge towards using fatty acids as responsive microcapsules for creating new functional materials, with potential applications in the personal care industry and topical drug delivery.	69,000.00	138,000.00	138,000.00	69,000.00	414,000.00
DE210100292 Lee, Dr Jessica C	This project aims to investigate how and why individuals differ in the way that they generalise from past experiences to novel situations. The goal of the project is to develop an innovative and formal model capable of predicting how a given individual will generalise based on their beliefs and personal traits, and to better understand how people behave when there are multiple conflicting ways to generalise. The expected outcomes of the project are a better understanding and measurement of generalisation, a fundamental psychological process. The outcomes of this project can be used to benefit the development of clinical treatment for anxiety disorders, of which overgeneralisation of fear responses is a defining feature. **National Interest Test Statement** Knowledge would be useless if we were not able to generalise to novel situations. This project investigates why different people generalise in different ways and offers a new theory to explain how this occurs. It will expand our knowledge of how generalisation occurs in everyday life and uncover factors that lead to more or less generalisation in different individuals. Understanding how generalisation leads to adaptive behaviour is critical in order to understand how it can become maladaptive. For example, this basic knowledge has social benefits in helping to inform clinical interventions such as ones that target maladaptive over-generalisation of fear in anxiety disorders, a common mental illness that is estimated to affect 2 million Australians each year (Beyond Blue).	60,605.00	125,547.00	129,829.00	64,887.00	380,868.00
DE210100357 Towler, Dr Alice K	Accurate face identification underpins normal social functioning and important identity verification procedures in society, government and the justice system. However, there is little understanding of the cognitive processes that give rise to individual differences in face identification. This project aims to develop a new cognitive model that characterises how holistic and part-based processing combine to determine individual differences in face identification. Expected benefits include advancing knowledge of human face perception, and evidence-based training and personnel selection tools to improve decision accuracy, help police prevent crime and terrorism, and avoid wrongful conviction of innocent suspects. **National Interest Test Statement** It is important to understand face identification because identity crime enables serious offences, including terrorism, financial crimes, and drug trafficking, and is estimated to cost Australia $2.65 billion dollars every year. Accurate face identification is also important for identifying offenders and avoiding wrongful convictions in the criminal justice system. Despite advances in face recognition software, face identification decisions are routinely performed by humans, and humans are surprisingly poor at identifying unfamiliar faces. This project will improve our understanding of what makes some people better than others, and develop new, evidence-based training and recruitment tools for improving the accuracy of staff in government, police and industry. This research is timely given the Identity-Matching Services Bill 2019, which would allow staff from government and private organisations to access facial images and other identity information from passports, police and immigration databases to verify citizens’ identities, and search these databases to establish the identity of an unknown person.	77,154.50	148,192.00	136,505.50	65,468.00	427,320.00

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DE210100453 Römer, Dr Udo	Currently, in order to stimulate different areas in nervous tissue, brain-machine-interfaces (BMIs) usually rely on multi electrode arrays where each electrode is connected to a wire, that connects to other electronics, all of which has to be safely encapsulated, thus increasing the size of the devices and complicating the surgical procedure for implanted devices. This project aims to develop a silicon multi-junction photodiode that can provide a photovoltage high enough to efficiently excite nervous tissue. A BMI based on this approach could be much smaller and could be powered optically via thin fibres, thus in the long run enabling smaller and safer implants for restoring function in disabled people.	72,148.00	146,110.00	149,056.00	75,094.00	442,408.00
	National Interest Test Statement This project aims to develop the foundations for a novel multi photodiode array for a variety of biomedical applications, including fundamental in-vitro research, better brain machine interfaces, or high-resolution visual prostheses. The developed technology would overcome todays constraints for such devices related to packaging and wiring, by using light as means to power electrodes for stimulating nervous tissue and thus might in the future revolutionise the way technology will be implanted in humans. Australia already has a range of world leading companies in the biomedical area like Cochlear and Resmed. If successful, the project outcomes could result in additional growth in this area. Overall the project aims to generate economic benefit for Australia and in the long term to improve the quality of life for patients. The project will contribute to Australia's National Science and Research Priority of "Advance Manufacturing" especially on "Cross-cutting technologies that will de-risk, scale up, and add value to Australian manufactured products".					
DE210100710 Bau, Dr Valentina	In contexts of protracted displacement such as refugee camps, cultural, religious differences, and the influence of violent extremist groups create an unstable environment for young people. There is a lack of research on the use of development communication interventions aimed at promoting peace in these contexts. This is a case study analysis of media projects in three refugee camps located in different geographical areas. The intended outcome is to generate evidence on a development communication approach that addresses humanitarian needs while simultaneously triggering mechanisms that initiate longer-term community and social development. The focus is on media use by displaced young people living in protracted situations of encampment.	71,938.50	146,727.00	136,326.50	61,538.00	416,530.00
	National Interest Test Statement In its 2018–2019 budget, Australia has increased its humanitarian assistance funding to $410 million, with $87.2 million allocated specifically to protracted emergencies, in response to record levels of humanitarian need and significant global displacement. Domestically, the Government has also allocated $1.9million in funding towards initiatives that combat violent ideologies and bring communities together. By studying the delivery of targeted media and communication programmes that promote development and peace among the encamped refugee population, this research will study a framework for development communication interventions that can not only facilitate humanitarian practices, but also contribute to a peace-oriented, community development process that supports young people in the complex environment of refugee camps and counteracts the influence of radicalisation. This also carries the potential to enhance public understanding of the value and benefits of the Australia Refugee Resettlement Programme.					
DE210100750 Moss, Dr Tristan E	This project aims to be the first study to address how Australia has approached space at the public and government level from the dawn of the space age in 1957 to today. Taking a historical approach, this project employs an innovative framework that integrates Australia's disparate space activities, analyses Australian space over a long time period, and centres the Australian experience within the global context. The project is particularly timely with creation of the Australian Space Agency in mid-2018. Through publications and collaboration with space scholars and stakeholders, this project aims to inform discussion of space policy and international cooperation in space, and develop new understandings of how Australians engage with space.	70,492.50	132,405.50	118,614.00	56,701.00	378,213.00
	National Interest Test Statement Space is a vital and integral part of Australia's defence, scientific research, industry, and international cooperation through the capabilities and information it provides. By increasing knowledge about Australia's long involvement in space, the project will provide scholarly insights into Australia's space activities, a field which, with the creation of an Australian Space Agency in 2018, the Australian Government is committed to supporting in the future. It will inform the Government's support of Australian space industry, and will provide deeper understandings of international relationships in space, particularly with the United States and Europe. The project offers value for money and will in particular leverage the award of a Fulbright Scholarship to the applicant to build collaboration with the United States in space. By uncovering the influences on space policy in Australia, including public attitudes, this project aims to inform and shape the approaches to space across a wide swathe of Australian life, from government, to defence, industry, science and academia.					

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DE210100858 Johal, Dr Wafa J	This project aims to address the challenge of effectively enabling novice users to train robots on complex tasks using instructional methods and gamification. With the recent advances of AI research, robots have now better cognitive and functional skills, research in robot training also now allows them to learn interactively from human. Since these robots are expected to provide assistance in different domains including education and healthcare, it is crucial to effectively engage human in robot's instruction. Expected outcomes include new methods for trainers to assess robot learning, and to improve their engagement and feedback. This should provide significant human-robot interaction benefits for accessibility of learning robots.	58,000.00	114,448.00	114,448.00	58,000.00	344,896.00
	National Interest Test Statement With the shortage of caregivers and the increasing number of dependent people, nurses and home aid are lacking. To cope with this, we foresee that caregivers could use robotic assistance in their work by programming them to accomplish certain chores - the caregivers focus on cognitive stimulations rather than physical chores, let to be done by the robots. In this project, we consider two very concrete scenarios to assist dependent living in their everyday life at home: 1) Sorting out groceries; and, 2) Cleaning the table. Robots will need to learn these behaviours within a reasonable amount of time while efficiently leveraging the sparse feed-back a human trainer can provide. This project aims to address the challenge of effectively designing theories and methods that will allow novices to efficiently train robots. The project expects to generate new knowledge in interactive robot learning by developing an innovative human-centred approach inspired by teachers' training methods. Expected outcomes of this projectshould provide significant benefits for accessibility of robotics and AI systems to end-users.					
DE210100912 Fardouly, Dr Jasmine	Social media platforms are starting to realise their social responsibilities and are looking for ways to reduce harm to their users. This project aims to evaluate the effectiveness and feasibility of specific social media content and activities for improving adolescent girls' body image. This project expects to generate new knowledge in the area of social media and body image by developing a novel theoretical model and an evidence base for effective positive social media activities for body image. Body image concerns are a global public health issue with a devastating impact on key aspects of people's lives. This project has the potential to inform the development of new ways to harness social media to support mental health and wellbeing.	75,587.00	151,000.00	149,657.00	74,244.00	450,488.00
	National Interest Test Statement Social media use is ubiquitous among adolescents and there is concern about its potential harms for wellbeing. Social media platforms have recently demonstrated their ambition to improve their online environment. The proposed project will provide a much-needed database of experimental evidence about the effectiveness of viewing and posting natural and body positive content for improving girls' body image and determine the feasibility and acceptability of those activities among girls in their everyday lives. The results of this research will inform future body image and eating disorder social media interventions. Identifying the utility of positive body image activities on social media could radically improve the lives of adolescent girls in Australia and around the world, improving their mental and physical health and their opportunities for career success. If administered early in life, positive body image social media interventions may also reduce the prevalence of eating disorders among girls, saving the Australian government almost $70 billion each year.					
DE210101055 Boughey, Dr Janina L	When government officials make decisions that affect a person's interests - eg whether to grant a social security payment or visa - the official must act lawfully, fairly and rationally. If they do not, there are means of review and redress for the affected individual via administrative law. But increasingly, government service delivery is outsourced and review mechanisms are lost. This project will analyse best practice approaches to administrative review and redress in different outsourcing contexts. It will generate new knowledge about the operation and effectiveness of redress mechanisms. This will benefit policy-makers and the community by enhancing transparency, fairness and accountability in outsourced decision-making.	57,626.50	115,152.00	109,761.00	52,235.50	334,775.00
	National Interest Test Statement The project will provide policy-makers with evidence on which to base decisions about how to design and structure outsourced decision-making arrangements, and which review, transparency and oversight mechanisms are appropriate in different outsourced decision-making contexts. It will be the first in the common law world to examine the various ways in which modern governments engage the private and community sectors to make decisions that impact on the interests and obligations of individuals, and best practice approaches to providing individuals with review and information rights in these various contexts. This will assist governments to properly balance social and individual costs and benefits when deciding whether to outsource service delivery, how to structure outsourcing arrangements, and which review, transparency and oversight mechanisms are appropriate in different contexts. The implementation of these guidelines will bring considerable benefits to those individuals affected by outsourced government decisions, who currently have limited access to review mechanisms.					

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DE210101137 Jamali, Dr Sina	This project aims to harness the intrinsic noise in a biological system to develop a new platform for biosensors. This will lead to advancement of a new versatile electrochemical platform for real-time screening with vast applications that span from sensing at sub-cellular level to point-of-care and implantable biosensors. The new sensory technique will improve the specificity, sensitivity and resolution in biosensors and enables measurement of multiple biomarkers simultaneously in real-time. The outcomes will contribute to a better understanding of fundamental physiological processes and chemical interactions at subcellular level which will inform future advancements in biomedical engineering. **National Interest Test Statement** In-depth understanding the physiological processes and chemical interactions at the sub-cellular level is the gateway to future advancements in biomedical engineering, i.e. personalized health monitoring systems and treatment, better biosensors and biomaterials. It is known that cells communicate via electrochemical mechanisms and this projects aims to exploit intrinsic electrochemical signals to deconvolute sub-cellar communication leading to technologies for better understanding and monitoring of cellular behaviour and interactions. While the medical applications are not within the scope of this proposed DECRA, the new sensory technology can be implemented in future to automate drug discovery and more importantly personalise diagnostics and treatments leading to more effective treatments at a lower cost. Given the ever growing market of biomedical sensors in Australia and globally, outcomes of the proposed research have great prospects for further industry investment and job creations while making a tangible contribution to technologies toward improving the health and well-being of general public.	75,067.50	152,175.00	154,265.00	77,157.50	458,665.00
DE210101138 Andrews, Dr Sophie C	This project aims to investigate the neurobiological and neuropsychological determinants of habit formation and change in the context of ageing, by combining cutting-edge techniques in psychology, behavioural neuroscience and neuroimaging. This research expects to generate new knowledge in the area of automatic habits and behaviour change, by investigating how these processes are affected in ageing using an interdisciplinary approach. Expected outcomes include a new, comprehensive model of habit formation and change in ageing. This should provide significant benefits, as it will lay the foundation for future habit-based behaviour change interventions to support older people to age well and productively. **National Interest Test Statement** With an ageing population, discovering new approaches to help older Australians to age well and productively is an urgent research priority. This project aims to elucidate the processes that drive habit formation and change in the context of ageing, and in doing so, lay the foundation to develop a new habits-based approach to behaviour change in this population that can be used to support a broad range of interventions to improve outcomes for older people. These might include supporting positive social, lifestyle, and health behaviours, aimed at maintaining wellbeing, independence and active participation in society for longer. This research therefore has the potential to contribute significant economic and social benefits to the Australian community.	74,746.00	146,544.00	144,065.50	72,267.50	437,623.00
DE210101155 Zhang, Dr Kefeng	The project aims to develop a framework that contains viable procedures to quantify, control and monitor the health risks associated with stormwater harvesting using Water Sensitive Urban Design (WSUD) systems (i.e., natural-based solutions). It expects to address the concerns about the safety of stormwater harvesting via WSUD for all end-uses. It will generate new knowledge regarding the real time control and monitoring of WSUD, thus truly advancing the WUSD technology as emerging urban green infrastructure for reliable stormwater harvesting. Expected outcomes include next generation of WSUDs implemented with real time control techniques, as well as a suite of easy-to-measure surrogate parameters for real time water quality monitoring. **National Interest Test Statement** Australia has been a world leader in Water Sensitive Urban Design (WSUD) research and practices. This project will solidify Australia's leadership in this field by pushing the boundaries of WSUD applications to stormwater harvesting for all water uses. The outcomes will enable practitioners to control and monitor WSUD in real time, thus increasing their confidence of using the already widely applied WSUD for producing reliable water - to supplement drinking water supply that can help Australia (one of the driest continent) to build more resilience against drought and enhance the water supply security. This is expected to address the existing critical concerns about adequately managing these systems to ensure that they not only deliver their intended environmental protection, liveability and public health benefits, but also mitigate water issues caused by climate change and urbanisation.	68,354.50	141,380.00	144,621.50	71,596.00	425,952.00

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DE210101157 Fang, Dr Ruopian	This project aims to overcome the performance bottlenecks of lithium metal anodes through carbon nano-tectonics for next-generation lithium batteries. Lithium metal is considered the ultimate anode material for future batteries, yet its practical use has been halted by the capacity degradation and safety hazard for long-lasting use. By establishing new fundamentals of nanocarbons towards constructing high-performance lithium anode, this project will produce new-concept lithium metal batteries with high capacity, safety and durability, along with molecular-level understanding of lithium redox processes. This is expected to promote the development of future electronics, vehicles and grid with zero-emission high-energy technologies.	69,458.00	137,916.00	136,916.00	68,458.00	412,748.00
	National Interest Test Statement This project will help to advance zero-emission high-energy technologies to satisfy the ever-increasing energy demand in electronics, electric vehicles and stationary energy storage. The widespread electrification of vehicles will greatly reduce the fossil fuel usage and alleviate greenhouse gas emission and air pollution, bringing environmental benefits. The development of large-scale energy storage technologies will facilitate efficient use of renewable and green energy resources, powering Australia's sustainable development in the long run with economic, commercial and social benefits to the nation. The research outputs would position Australia at the frontier of advanced energy technologies and strengthen the future competitiveness of Australia in material science and engineering and energy technologies.					
DE210101162 Rahim, Dr Md. Arifur	This project aims to explore natural polyphenols to functionalise liquid metal (such as gallium and its alloys) nanoparticles via a coordination-driven self-assembly process. This will advance our current understanding of the interfacial chemistry involved in liquid metal processing toward the synthesis of diverse functional systems. It is expected that such a unique combination will result in hybrid nanostructures possessing synergistic properties with potential applications in conductive surface patterning, toxic metal detection and solar steam generation. The developed strategies to manipulate liquid metal interfaces with ubiquitous natural compounds will lay the foundation for future investigations across diverse scientific disciplines.	65,000.00	130,000.00	132,500.00	67,500.00	395,000.00
	National Interest Test Statement Efficient and cost-effective surface functionalisation strategies for room temperature liquid metals such as gallium and its alloys, remains underachieved to realise the full potential of liquid metals for applications in diverse areas including flexible electronics, sensors and energy. This project will take advantage of the extraordinary set of chemical properties exhibited by naturally abundant polyphenols to functionalise liquid metal nanoparticles using self-assembly as a tool. This will advance our understanding of the complex chemistry associated with liquid metals and set the design rules to synthesise hybrid composites with complementary properties leveraging from both the polyphenols and liquid metals. The developed methods from this project will allow efficient processing of liquid metals and fabrication of high value and sustainable products that will find applications in the electronic, sensor and energy industries.					
DE210101183 Zalnieriute, Dr Monika	This project aims to expand knowledge of the effectiveness of Australia's discrimination and data privacy laws by drawing on empirical mixed methods and comparative US and EU experiences, to provide a new understanding for tackling novel emerging forms of data and artificial intelligence (AI) -driven discrimination and extending Australia's legal capacity in empirical mixed methods research. Intended outcomes include a comprehensive empirical dataset and a normative model for legal reform to address AI and data-driven discriminatory practices in the digital age, thereby contributing to Australia's AI and machine learning capability, increasing equality, offering reduced risk and long-term economic and social benefits.	66,624.50	141,878.50	146,640.50	71,386.50	426,530.00
	National Interest Test Statement This project contributes to the development of Australia's artificial intelligence (AI) and machine learning capability (Australian Government Budget Statement 2018-2019) by developing a normative framework for future development of Australian discrimination and privacy law to address novel forms of AI / data-driven bias, thereby advancing critical knowledge, needed the for Australian leadership in responsible development of AI, offering long-term economic and social benefits. To realize these goals, Australia must not lag behind the USA and the EU not only in developing the technical skills 'needed for AI' but also in understanding and addressing AI and data-driven discrimination, associated with such technologies. The project draws on empirical mixed methods and comparative US and EU experiences, to provide a new understanding for tackling novel emerging forms of data and AI-driven discrimination, extending Australia's legal capacity in empirical mixed methods research, and providing strategic policy advantage, long-terms economic, commercial, and social benefits to the Australian community.					

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DE210101259 Kumar, Dr Priyank Vijaya	Plasmonic catalysis is a promising platform for sunlight-driven chemical reactions that employs optically absorptive plasmonic-metal/semiconductor nanostructures. However, it suffers from poor external quantum efficiencies. The aim of this project is to rationally design an efficient plasmonic photocatalyst utilizing state-of-the-art ab initio computations. The project is expected to provide insights on various atomic-level reaction steps involved and consequently develop a set of catalyst design principles to guide experiments. The project will largely benefit Australia's and international renewable energy sector and chemical industries by generating knowledge in catalysis relevant for hydrogen production and greenhouse gas reduction.	58,000.00	115,000.00	122,000.00	65,000.00	360,000.00
	National Interest Test Statement The project expects to uncover novel physical phenomena, concepts and scientific knowledge in the area of plasmonic photocatalysis, which will lead to a new way of controlling chemical reactions with light. Several novel computational techniques will be introduced through this project in Australia, thus strengthening technical capabilities in Australian science. Economically, the design rules that will guide experimental synthesis of novel catalysts will have a positive impact on Australian chemical manufacturing industries. The ability to carry out chemical reactions efficiently using sunlight is critical to several upcoming technologies such as hydrogen production, biomass conversion, solar fuels and greenhouse gas reduction, thus benefiting the Australian renewable energy and environmental sector.					
DE210101563 Gupta, Dr Souradeep	This project aims to address the pressing need to curb carbon dioxide and sulfur oxide level in the air through direct air capture technology using foamed concrete with engineered biochar, prepared by pyrolysis of food waste. The expected outcome of the project would be a durable biochar-foam concrete technology that enhances uptake of the mentioned pollutants, thus reducing their concentration in the ambient environment. It links to Australian Government's Science and Research priority areas of Resources and Environmental Change through utilization of waste-stream and offering an adaptive measure to impacts of climate change. Deploying this technology would offer durable lightweight construction and healthy environment for urban residents.	75,000.00	150,000.00	150,000.00	75,000.00	450,000.00
	National Interest Test Statement Rising carbon dioxide (CO2) level and increase in sulfur oxide (SOx) concentration from natural calamities and anthropogenic sources pose a threat to healthy environment in urban areas. Furthermore, disposal and land-filling of food waste contribute to greenhouse gas emission and incur significant cost to Australian economy. The proposed research addresses these major challenges by developing specially engineered food waste biochar based foamed concrete that would improve concrete's capacity to capture and sequester CO2 and SOx from the urban air. This technology would lead to improvement in air quality, while recovering resource from organic waste streams. The developed biochar-foamed concrete would satisfy the mechanical and durability properties required for targeted application as lightweight building blocks and façade panels. Deploying this technology would ensure durable lightweight construction that will 'clean' the urban air and provide healthy environment for the urban residents.					
DE210101565 Suryawanshi, Dr Mahesh P	This project aims to develop a library of earth-abundant chalcogenide perovskite nanocrystals (CPNCs) for efficient solar energy conversion applications. The key concept is to design non-toxic and stable CPNCs using a facile solution process for solar-to-electricity and fuel generation. The intended outcomes include a fundamental understanding of the relationships between the synthesis, structure, photophysics, and electrochemistry by advanced modeling and multiscale characterizations and ultimately the solar-to-electricity and fuel generation performances of new material systems. This project will build a national research capacity in an emerging field and put Australia at the forefront of practical solar energy conversion technologies.	70,356.50	140,939.00	141,240.00	70,657.50	423,193.00
	National Interest Test Statement The efficient harvesting of solar energy is urgently needed to tackle the growing energy demand and deleterious effects of the large scale consumption of fossil fuels worldwide. This project will develop a series of earth-abundant and stable energy materials for sustainable electricity and hydrogen generation from solar energy. This project feeds into the Science and Research Priority of "advanced manufacturing", "energy" and "environmental change", as the developed ionic energy materials-based photovoltaic and photoelectrochemical hydrogen generation devices can mitigate the energy and environmental problems simultaneously. This project can also provide professional training for the next generation of scientists with multi-disciplinary skills and broad knowledge in materials science, physics, electrochemistry, and engineering. The intended groundbreaking results would not only produce high-quality and high impact publications but also potentially generate economic value to the community. The outcome of the project will strengthen Australia's global position as a leader in solar energy research.					

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DE210101618 Kim, Dr Dong Jun	The project aims to create a new strategy for designing redox-active supramolecular compounds for energy storage devices. The project covers the simultaneous development of electrode-active materials, in-depth characterisation, and cell fabrication by combining supramolecular chemistry and advanced battery engineering. The knowledge anticipated to be accumulated through the project will be a fundamental cornerstone for achieving large-scale energy storage devices for renewable energies, and an effective approach for resolving climate change driven by global warming. **National Interest Test Statement** This DECRA project provides valuable insights into both fundamental as well as practical standpoints—i.e, the field of supramolecular chemistry and energy storage. The project proposes employing supramolecular-based redox-active organic compounds as the electrode-active materials for rechargeable aluminium batteries. The aluminium batteries are expected to play a significant role in next-generation energy storage applications, however, still remaining in a primitive stage. The outcomes and from this project would attract substantial attention from a broad spectrum of the international scientific community and become a textbook example of an interdisciplinary research program. Success in this project will launch a new platform designing large-scale batteries. Ultimately, the integration of energy storages and harvesting systems would accelerate the transition toward the renewable energy conversion systems and provide the opportunity to achieve clean-energy as well as energy-independence most directly.	68,500.00	139,500.00	140,000.00	69,000.00	417,000.00
DE210101625 Makki Alamdari, Dr Mehrisadat	72% of bridges in Australia were constructed before 1976. Currently bridges are inspected by biennial visual inspection which is expensive, time consuming and subjective. Considering the large number of defective bridges in Australia and around the world and the limited budget of road authorities, this project aims to develop a low-cost and robust bridge monitoring framework by advanced data analytics, solely based on the response of a moving vehicle passing over the bridge, with no equipment to be installed on the bridge. The project is significant because it opens a new direction for sustainable monitoring of such ageing infrastructure, consequently resulting in the lower costs of maintenance, enhanced safety and extended asset life. **National Interest Test Statement** Collapse of bridge infrastructure can be avoided if effective condition monitoring tools are adopted to signal onset of damage and enable timely repairs. This research aims at developing a robust framework for bridge condition monitoring. The project is significant because it opens a new direction for sustainable, low-cost and reliable condition monitoring of bridge structures through an innovative approach which has high potential for commercialisation and technology transfer. The major benefits of this research are the lower costs of maintenance, increased productivity, enhanced safety and extended asset life of large proportion of bridge infrastructure. This research can significantly contribute to Australian society and national economy. It also holds the potential to place Australia at the forefront of research and development in the growing area of smart infrastructure.	69,712.50	142,375.00	145,325.00	72,662.50	430,075.00
DE210101883 Hu, Dr Chuangang	This project aims to address the problem of excessive carbon dioxide in the atmosphere by utilizing newly designed - carbon architecture derived catalysts and constructing important integrated devices. The insights thus gained will generate new knowledge both in the chemical sciences of understanding the mechanism of carbon dioxide reduction on advanced carbon-based catalysts, and the engineering of effectively integrated devices. The expected outcome of this project is a low-cost approach to the sustainable generation of clean and renewable value-added chemicals from carbon dioxide driven by sunlight, which provides significant benefits for human society in terms of clean energy and environmental protection. **National Interest Test Statement** This DECRA project focuses on fundamental understanding of advanced metal-free carbon-based catalysts for carbon dioxide reduction, and translating this metal-free catalysis technology to cost-effective production of renewable value-added chemicals from carbon dioxide and sunlight. This will reduce greenhouse gas emissions as well as fossil fuel consumption for conventional chemical and energy production. Successful execution of this project will contribute significant national benefit in protecting our environment and natural resources. It will also potentially provide economic benefits by eliminating the use of expensive precious-metal catalysts in chemical production, and maximizing the global impact of Australian metal-free catalysis technology and advanced chemical engineering. The long-term societal impact includes, but is not limited to, a rich interdisciplinary research portfolio for student training, adding to the highly skilled workforce in these important and specialised areas both in Australia and worldwide.	67,658.00	134,816.00	134,316.00	67,158.00	403,948.00
	The University of New South Wales	1,506,992.00	3,024,530.00	3,015,961.50	1,498,423.50	9,045,907.00

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The University of Newcastle						
DE210100103 Bromfield, Dr Elizabeth G	Cellular stress is responsible for widespread inefficiencies in plant and animal reproduction. Using high resolution proteomics and cryo-electron microscopy, this project aims to investigate how plant and animal germ cells respond to environmental stresses that are known to disrupt fertility, and assess two novel strategies to decrease the sensitivity of cells to stress. This project is expected to generate new global knowledge in the area of fertility regulation with the potential to improve the tolerance of crop species to heat stress, prevent economic losses and help to secure future food production. Further, this project has the intended benefit of improving the fertility of animal species that suffer from stress-induced infertility. **National Interest Test Statement** This project will make significant contributions to the future prosperity of Australia by developing novel strategies to fortify our plant crops, and animal species against environmental stresses that affect reproduction. This work will enhance our knowledge of cellular stress pathways and how these affect the fertility of plants and animals and in doing so, will help to consolidate the strong standing of Australian research in the field of reproductive biology. Moreover, through the development of new national and international collaborations this project will enhance the impact of precious ARC funding and improve the reach of ARC objectives. This project will generate a critical knowledge base for applied research in which stress pathways can be modulated to improve assisted reproduction in horses and cattle, fortify crop species against abiotic stresses. Moreover, this project will provide outstanding, industry relevant training opportunities for PhD candidates at The University of Newcastle.	77,158.00	154,076.00	152,679.00	75,761.00	459,674.00
DE210100180 Tornier, Dr Stephan	Symmetry is a fundamental organising principle in mathematics and human endeavour. This project aims to advance our knowledge of zero-dimensional symmetry, a frontier in symmetry research. In the longer term, advancements in fundamental knowledge in this area have the potential to inform the usage and development of digital structures in more practical contexts, such as data networks and information processing. The project is expected to develop new tools of both theoretical and computational nature that will accelerate ongoing research across the field and enable new approaches. This will cement Australia's position at the forefront of research in symmetry and its use in the digital age. **National Interest Test Statement** This project aims to advance our understanding of symmetry, which is a fundamental organising principle in mathematics, science and the arts. It investigates the symmetries of digital structures, an important field of applications of mathematics to technology. The understanding gained will lead to the creation of software for the analysis of such structures and have the potential to inform their use in practical and nationally significant contexts such as data networks and information processing. The project will help to maintain Australia’s leadership of current international research on the subject by building on activities of the Zero-Dimensional Symmetry Group (Laureate Prof George Willis, UON) and The Centre for the Mathematics of Symmetry and Computation (Emeritus Prof Cheryl Praeger, UWA). In doing so, it will strengthen research links between Australia and other key centres in New Zealand and Europe. Finally, the project includes the training of students at various levels and thus contributes more broadly to the mathematical skills base that is vital to be ready for the challenges of the future.	66,612.50	134,275.00	133,625.00	65,962.50	400,475.00
DE210100430 Kurt, Dr Umit	This project examines the transformative dimensions of mass violence committed against the minorities of the Ottoman Empire – Armenians, Assyrians, Yazidis, and Greeks – and the historical impact and consequences of the Empire’s violent history on the Balkans and the Levant (Syria, Iraq, and Lebanon). In particular, it highlights the crucial role played by international, inter-state, central, and regional actors, who undertook critical roles in the national and community-building process of the Empire, resulting in the foundation of the new Turkish Republic (1923). It will rethink the classical historical narrative about the emergence of the post-Ottoman Middle East, and seek to understand the wider, global dimensions of mass violence.	62,547.00	131,451.50	122,165.00	53,260.50	369,424.00

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	National Interest Test Statement This project will contribute to Australia's national interest by generating new knowledge about the origins of the present-day conflicts in the Middle East and the way we understand them in the modern world. Australia has been involved in military and humanitarian missions in the Middle East, from the ANZACs at Gallipoli to the Yazidis at Mount Sinjar. We have multiple, strong, and at times complex, relations with Turkey. The upheavals that took place between 1890 and 1920, which led to the dissolution of the Ottoman Empire and the creation of the modern Republic of Turkey, laid the foundations for the ongoing conflicts in the region today. The project will benefit research end-users such as history educators and cultural institutions but also the wider Australian community – which includes many people whose history of migration dates back to Ottoman Turkey – by providing historical depth to public debate. The project will further enhance Australia's international reputation for historical research.					
DE210100680 Allen, Dr Jessica A	This project aims to develop a novel solar-driven manufacturing process able to produce advanced carbon materials which effectively sequester carbon dioxide (negative emission). The project expects to provide key data and insights into a new method of carbon capture and utilisation through advancement of the fundamental science of carbon electrolysis and carbonate regeneration. A combination of advanced electrochemical and engineering techniques will be utilised to achieve this from lab-scale experimental work through to process modelling. Expected outcomes of this project include a clear understanding of the practical potential of this negative emission technology in contributing to offsetting global carbon dioxide emissions.	75,212.50	144,425.00	136,425.00	67,212.50	423,275.00
	National Interest Test Statement Australia has the potential to become a renewable energy superpower. The challenge with variable input energy sources such as solar and wind is how to capture and export these natural resources for enhanced economic prosperity. In this project, solar energy is efficiently channeled into a novel manufacturing process, generating advanced carbon materials able to be applied to another emerging market, that of electrical energy storage. This process is a negative emission technology option which both captures and utilises carbon dioxide as an input feedstock, leading to its permanent removal from the atmosphere and sequestration in an incredibly high value and stable carbon product. Uptake of renewable energy alone is not enough to stem the tide of global emissions. We also need negative emission technologies such as the one described here to offset emissions generated in all sectors, such as manufacturing, beginning to reverse what seems like irreversible carbon dioxide release.					
	The University of Newcastle	281,530.00	564,227.50	544,894.00	262,196.50	1,652,848.00
The University of Sydney						
DE210100004 Holmes, Dr Ryan M	The Tropical Pacific drives significant year-to-year variability in Australian rainfall and climate extremes. However, tropical climate predictions are severely limited due to systematic biases in numerical climate models. Using new techniques and leveraging international collaborations, this project aims to transform our ability to simulate tropical Pacific climate through a new understanding of key air-sea interaction and ocean mixing processes. Expected outcomes include a better representation of tropical climate in the Australian climate model and improved seasonal to interannual predictive capability. These improved predictions will give communities more time to prepare for extreme events such as droughts, heatwaves and bushfires.	73,582.50	147,630.00	146,510.00	72,462.50	440,185.00
	National Interest Test Statement The El Nino-Southern Oscillation is the most energetic mode of natural climate variability on Earth and strongly impacts Australian rainfall and extreme events. Sustained El Nino conditions explained approximately two thirds of the reduced rainfall in East Australia during the 2001-2009 Millennium Drought, for which the Australian government gave out over $4bn in drought-assistance aid. This project aims to build the knowledge and capacity of the Australian climate modelling community to provide better, earlier and more robust predictions of El Nino. Such improved predictive capability would enhance the resilience of Australian communities to extreme climate events such as droughts and bushfires, thereby reducing the associated disaster managements costs and impacts. The project will also contribute to building a stronger, more capable Australian climate science community by helping to establish the University of Sydney as a new centre for climate science and oceanography and enhancing national and international collaborative networks.					

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DE210100084 Zahirovic, Dr Sabin	Reefs and carbonate platforms represent the most prolific component of Earth's carbonate factory on geological timescales. The project will develop a digital community framework for modelling the rise and demise of carbonate platforms on geological timescales. The project will untangle the relative influence of tectonics, dynamic topography from mantle convection, sea level change, climate, and terrestrial sediment runoff on the growth and drowning of carbonate platforms. The outcomes will identify the environmental conditions that shut down reefs on the scale of the Great Barrier Reef, quantify the carbon storage potential of carbonate platforms, and model the tectonic development of Australia's continental margins in unprecedented detail.	76,962.50	148,770.50	148,751.50	76,943.50	451,428.00
	National Interest Test Statement The Great Barrier Reef contributes $6.4 billion to Australia's economy annually, but is threatened by rising sea levels and terrestrial run-off. This project will evaluate how similar reef systems flourished and perished in the geological past, and will quantify the carbon dioxide storage potential of Australian continental margins. The community tools developed in this project can also be applied to de-risk low-carbon energy exploration, and aid exploration of sediment-hosted mineral resources required for a high-tech low-carbon global economy. This project will place Australian Earth science at the forefront of a new modelling capability that fuses tectonic, geodynamic, atmospheric, and marine processes to track the contribution of Earth's biological carbonate factory to the planetary carbon cycle. The easy-to-use modelling infrastructure will provide an unprecedented educational and outreach tool that captivate the imagination of the Australian public, trigger interest in geosciences in younger generations, and illustrate the geological evolution of the Australian continent in unprecedented detail.					
DE210100256 Petersen, Dr Charlotte	Predicting the rigid behaviour of glass from its disordered, amorphous atomic structure remains a challenge in materials science. This project aims to define an innovative measure of structure based on how constrained each particle is, which can be quantified by measuring the particles' vibrations. Using this new measure of structure, this project expects to link the microscopic structure of glass to its macroscopic properties via computer simulations. Expected outcomes of this project include a new methodology for characterising amorphous materials and an improved understanding of the nature of glass. This should provide significant benefits, such as an increased ability to rationally design amorphous materials with desired properties.	68,657.50	138,111.00	138,984.00	69,530.50	415,283.00
	National Interest Test Statement This project is expected to drive innovation in scattering experiments, which will provide significant benefit to material characterisation. Such experiments will allow more value to be extracted from Australia's existing microscopy and neutron scattering facilities. The new methodology proposed in the project could lead to experiments capable of fast measurement of the properties of an amorphous material, without the need to destroy the sample. This has the potential to save significant amounts of time and resources in Australia's design and manufacturing industries. Additionally, it is expected that the results of this project will lead to a better understanding of how the structure of an amorphous material determines its properties. This could allow for the smart design of amorphous solids with an extremely large range of behaviours. Great economic and social benefits could result from such a breakthrough, and contributing to the science underpinning this development at an early stage would give Australia the opportunity to be at the forefront of a possible materials revolution.					
DE210100263 Li, Dr Wei	This project aims to develop adaptive resource management solutions in edge computing systems for efficient management of the use of limited computing resources and varying renewable energy resources without compromising the stringent needs of emerging Internet of Things applications. These resources will be jointly managed on the diverse, dispersed, often independently owned and operated edge devices with a set of prediction, scheduling and energy saving techniques. The expected outcome is to realise a sustainable edge computing system to reduce both operational cost and negative environmental impact of the system. This project will elevate Australia to be a dominant player in sustainable computing and lead future development trends.	70,962.50	141,925.00	141,925.00	70,962.50	425,775.00
	National Interest Test Statement The designs of this project will greatly encourage the increased use of renewable energy in the ICT (Information and communications technology) sector towards meeting the short-term and long-term goals of Australia, which will reduce emissions to 26-28 percent on 2005 levels by 2030, and achieve net-zero emissions by 2050. The ultimate goal of the project is to substantively contribute to the provision of technological solutions and wealth creation that will help building a greener and more sustainable planet. The fully utilisation of the capabilities of sustainable edge computing systems will ensure information can be processed effectively and efficiently. This project will reduce the growing ICT carbon footprint by reducing the daily consumption of brown energy. Meanwhile, these sustainable ICT technologies will be used as enablers to reduce the carbon footprint of production and the brown energy consumption used by the current or future IoT applications. This will shape the future of industrial computing and pave the way for the development of edge computing systems.					

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DE210100368 Veen, Dr Alex	The gig economy is at the forefront of 'algorithmic management', a major technological disruption of management, work, and employment. Used to replace humans as organisational managers, these systems are projected to spread wide across the Australian economy yet remain poorly understood. This study will systematically interrogate the nature and operations of algorithmic management across platforms operational in the Australian gig economy. It will explore the design and oversight of, workers' experiences with, and the role end-users play in sustaining these systems. The study will generate state-of-the-art academic knowledge and provide guidance to policy makers on how to respond to, and where necessary regulate, algorithmic management.	59,158.00	131,816.00	138,877.50	66,219.50	396,071.00
	National Interest Test Statement Australian workers are witnessing the rapid replacement of their human managers by automated systems. Standard management tasks, such as scheduling, logistics and responding to customer feedback, are being devolved to data-driven, self-learning technologies. While technology-driven management looks efficient, it can also obscure underlying processes, embed biases or discriminatory practices and limit workers' personal discretion. In fact, we know little about how such systems affect workers, end-users, businesses and broader society, and what they mean for future worker-management relations. This project will provide clear understandings of workers' and businesses' real-world experiences of automated management. It will detail the practical and ethical implications, and impacts on worker performance and satisfaction. This research will benefit Australian regulators, worker advocates and industry as they look for evidence-based strategies to improve the oversight and operation of automated management systems.					
DE210100391 Tseris, Dr Emma	Involuntary mental health treatment is often traumatising, with women reporting additional gendered dimensions of harm. Using an action research framework that draws upon the voices of service users, families and professionals, this study aims to develop improved strategies for responding to acute mental distress in women, with a focus on reducing coercion. Expected outcomes include enhanced understandings of the experiences and impacts of compulsory mental health treatment on women and a co-designed online resource that will support the development of effective, realistic and non-coercive practices in frontline mental healthcare. The project will provide substantial benefits to mental health reform at a national and international level.	69,895.50	141,938.50	139,218.50	67,175.50	418,228.00
	National Interest Test Statement The project will generate significant new knowledge to improve national and international mental health service provision. Mental health reform is a high priority of the Australian government, at both a state and federal level, as evident in the Roadmap for National Mental Health Reform 2012-2022, the current Royal Commission into Victoria's Mental Health System, and the 2018 NSW Parliamentary Inquiry into the seclusion, restraint, and observation of mental health consumers. This study will develop resources and strategies co-designed by consumers, families and mental health professionals, to guide mental health policy and practice in relation to women experiencing acute mental distress. A key focus of the study will be on the development of alternatives to coercive practices, which have been shown to have many deleterious and traumatising effects. The project will contribute to scholarship at the intersections of mental health, gender equality, and human rights. The study will disseminate the research findings through a range of scholarly outlets and public engagement activities.					
DE210100415 She, Dr Changyang	This project aims to develop fundamental theories and practical technologies for ultra-reliable low-latency communications – one of the grand challenges in 5G cellular networks. Due to the dynamic nature of wireless networks, existing approaches dividing networks into multiple layers cannot guarantee a hard deadline with high reliability. The outcomes of the project will be cross-layer models for characterising the end-to-end performance, a prediction and communication co-design framework for improving the delay-reliability trade-off, and an online architecture for implementing model-based algorithms in real networks. They will underpin the development of remote control and advancing automation in manufacturing, transportation, mining, etc.	72,072.50	144,169.00	144,169.00	72,072.50	432,483.00
	National Interest Test Statement 5G technologies will have significant benefits to Australia, not only in contributing up to $50 billion to Australia's GDP by 2030, but also positioning Australia as a global leader in Industrial 4.0 (the fourth industrial revolution). This project is designed to resolve ultra-reliable low-latency communications in wireless networks. The new theoretical models, design methodologies, and practical technologies developed in this project will enable automation in vertical industries of 5G, including transportation, manufacturing, agriculture, mining, etc. In addition, the design goal of this project is aligned with the business priorities of network operators and their partners. They have displayed some test cases in surgical operations, autonomous driving, and online gaming, where the delay and reliability in communication systems are critical for the experience of users. In summary, the outcomes of this project will help to reduce the increasing burden on human resources in Australia, create new revenue to Australian companies, and facilitate everyday life of Australian people.					

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DE210100440 Haghani, Dr Milad	The ability to rapidly and safely evacuate crowds can mean the difference between death and survival in mass emergencies. While the immediate reaction of the public to an emergency is paramount for their survival, their role in crisis management is often not fully harnessed. This project establishes an innovative and pragmatic approach in urban emergency planning: optimising evacuations through behavioural training. Pioneering empirical steps will be taken to discover optimum strategies that individual crowd members should adopt, and to establish the extent to which modifying crowd response can be effective. The outcomes will result in educational guides that will increase public awareness and community preparedness for public emergencies.	67,120.50	137,733.50	142,726.00	72,113.00	419,693.00
	National Interest Test Statement The reaction and preparedness of the individuals involved in public emergencies are the most critical factors in determining their survival. Yet, this potential dimension in emergency planning, i.e. enhancing individual preparedness, is often overlooked. This project presents a major shift from the conventional paradigm that looks at people in crises merely as an obstacle and problem to control. It explores how people themselves can become part of the solution to disaster mitigation by producing more efficient responses to the crisis. The project's aim is to discover how one can make people in crowds better prepared for self-evacuations by modifying their responses and strategies. This empirical study will therefore unlock the door to the innovative dimension of behavioural intervention, education and training in evacuation planning. The findings will become the next important step to discovering optimal individual strategies and developing evidence-based public education guides that can significantly improve community resilience, disaster planning and crowd management practices at international scales.					
DE210100457 Stenberg, Dr Josh S	This project aims to address the reception of China's state-funded cultural diplomacy initiatives among Overseas Chinese communities in multicultural societies. Using performance observation, interviews and analysis of archival sources, it will assess how Sino-Southeast Asian communities react to local and transnational pressures and stimuli as the Chinese state invests in soft power, of which cultural diplomacy is a vital element. Expected outcomes include new knowledge about how and why culture in diaspora changes in response to regional and domestic geopolitics, and a more robust understanding of how China's state-led soft power initiatives function beyond the economic sphere.	59,912.00	127,922.50	128,981.00	60,970.50	377,786.00
	National Interest Test Statement Australia's national interests would be significantly advanced by a more complete view of the large and growing international soft power initiatives of the People's Republic of China, including cultural diplomacy. In recent years, the PRC has sharply increased investment in cultural diplomacy, including spectacular and wide-ranging performance programs aimed at Overseas Chinese communities. A key focus of this campaign has been Southeast Asia, which is home to long-established and substantial ethnic Chinese communities. Such communities are both target audiences and cultural mediators of these "soft power" initiatives. This project will provide a robust evidence base to assess how the PRC's efforts to represent itself as a nation with strong cultural ties to countries in the Asia-Pacific are playing out in our region. A firm grasp of the nature and intent of cultural diplomacy is imperative for Australia to understand the PRC's emerging regional role both culturally and politically.					
DE210100473 Li, Dr Sinan	Micro-inverters offer a unique ability to maximise solar energy yield and streamline the installation, operation and maintenance process of solar power generation, thus having huge potentials to drastically reduce the cost of solar electricity. However, performance limits have hampered their wider applications in the energy sector. This project aims to tackle the performance challenges of micro-inverters by developing a novel power-conversion architecture, a unified design framework, and a new control theory. The intended research outcome will be a new range of ultra-high-performance micro-inverters. This will promote greater solar uptake and maintain Australia's leadership in the development of disruptive solar power generation technology.	77,109.50	154,219.00	154,177.00	77,067.50	462,573.00
	National Interest Test Statement To meet the very ambitious and ever-challenging renewable energy targets set by Australia and countries around the world as one of most pivotal approach towards greenhouse gas emission reduction, there is a big and timely need for a drastic drive down of the cost of solar power generation to support greater affordability and reliability of solar energies. Employing a ground-breaking solar inverter technology, this project will provide economically viable and technically elegant solutions to next-generation solar power generation. Engineering these new solar inverters in a scalable manner will strengthen Australia's economy, lead to new industrial companies in the emerging field of renewable power generation and smart grid, attract international investments, create ample job opportunities, and most importantly, provide a competitive pathway towards a sustainable future.					

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(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
DE210100586 McKay, Dr Carolyn	Digital technologies are rapidly transforming the criminal justice system, with audio visual links replacing physical presence in courtrooms and direct human communication. But are these technologies delivering fair criminal justice? This project aims to examine the scope and impact of digital justice on vulnerable users. It expects to generate new knowledge on digital justice and vulnerability using comparative law, interviews and observations across three countries. Expected outcomes include a model of digital vulnerability and strategies to address digital inequality. This should significantly benefit policy-makers, practitioners and public confidence in the justice system during this period of digital transformation.	68,000.00	144,000.00	152,000.00	76,000.00	440,000.00
	National Interest Test Statement This project has potential social benefits for Australian community members who serve or are involved in the increasingly digitised criminal justice system. It will provide significant benefits to the judiciary, court administrators, lawyers, service providers and policy-makers. This research will present an extensive, comparative understanding of how digital communication technologies, such as audio visual links, impact the vulnerable, how digital vulnerability may be understood, and how new technologies transform criminal procedure and procedural justice values in three jurisdictions. The project will be beneficial in formulating guidance and a model of digital vulnerability for judges and lawyers when working with vulnerable people in criminal procedure. The research will benefit vulnerable individuals who become involved in criminal procedure whether as victim, witness or defendant. Looking to the future, the project will advance and enhance further technological innovation and economic efficiencies in the Australian criminal justice system in manner that is socially responsible, inclusive and humane.					
DE210100602 Ramezani, Dr Mohsen	This project aims to develop novel quantitative models and market design methods to fundamentally transform the analysis, control and regulation of shared and automated point-to-point transport services in multimodal networks. The project offers an innovative non-equilibrium approach that models multiple competitive transport platforms, travellers, freelancer drivers and transport legislator entity to ensure achieving social welfare. The project outcomes address the eventual transition towards automation where platforms own and utilise different proportions of AVs in their fleet. The project expects to generate new knowledge of transport science that can be used to lessen social, economic and environmental impacts of private car ownership.	69,500.00	139,000.00	142,500.00	73,000.00	424,000.00
	National Interest Test Statement This project will provide a major scientific breakthrough in theoretical modelling of shared and automated point-to-point transport services. This research has a significant impact on how people travel in cities today and in the foreseeable future in which travellers buy access to transport services using, for example, a shared and automated service rather than owning a car. This is in accordance with full utilisation of the well-acknowledged benefits of AVs to regulate and manage the shift from car ownership to a transport-access modality. This project enables state and federal transport legislator organizations (e.g. TfNSW) to adopt regulations to manage the competition among multiple shared and automated transport companies to ensure maximising social welfare, thereby helping Australian cities achieve sustainability and equity goals. The project outcomes will significantly contribute to smart cities initiatives that enable reducing travel time, fuel consumption, noise pollution, greenhouse gas emissions, and personal transport costs leading to safer roads and economic competitiveness of Australia.					
DE210100662 Akhavan, Dr Behnam	Hybrid combinations of hydrogel and solid materials allow a high level of functionality for devices such as tissue-engineering scaffolds and soft machines. However, the weak bonding between hydrogels and solids severely hampers their function. This project aims to develop versatile plasma processes that facilitate strong interfaces between hydrogels of choice and solid materials of all kinds. The expected outcome is a green platform technology for the modular construction of advanced solid-hydrogel hybrids with tailor-made functions; enabling critical advances in the design and synthesis of structured soft matter devices. The project offers significant benefits for Australian high-tech manufacturing industries from health to electronics.	75,500.00	151,000.00	151,000.00	75,500.00	453,000.00
	National Interest Test Statement This DECRA program will develop a platform, plasma-based technology to solve a long-lasting challenge in the fabrication of functional and robust solid-hydrogel structures. This new enabling technology will position Australia at forefront of this globally significant, emerging field and bring substantial national economic benefits for decades to come. Major advances in interface engineering will be realized; underpinning the development of multi-component materials for modern, far-reaching applications. As one example, the new hybrid solid-hydrogel materials will be bio-functionalized for tissue engineering applications. The potential of plasma surface engineering for the fabrication of hybrid materials unlocked in this program will make future research directions and other intriguing applications possible. Examples include wearable electronic devices and artificial nerves in the emerging field of soft robotics. Translation of this green and environmentally friendly plasma-based technology will ultimately lead to the significant societal benefits of improved healthcare outcomes and quality of life.					

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DE210100953 Norris, Dr Barnaby R	Understanding our place in the universe and the possibility of life are profound questions. This project aims to develop innovative astro-photonic technologies to enable imaging of Earth-like planets beyond our solar system, and to perform unprecedented observations. The project expects to generate new knowledge and innovation in exoplanet science and photonics. Expected outcomes include the first glimpse of the most Earth-like planet to date, and the development of ground-breaking technology. Benefits include technological innovation — benefiting fields such as remote-sensing, space-communications, life-science imaging, as well as astronomy — and revealing key insights into our planet's history and the potential for life in the universe.	72,500.00	137,500.00	130,000.00	65,000.00	405,000.00
	National Interest Test Statement The project provides national benefit in several areas. This project will secure Australia's place as a world leader in not just astronomical science but in astro-photonic technologies. Australia is already recognised throughout the world as leading in innovation in photonic technologies, both for commercial purposes (such as telecommunications) and scientific, and this project will reinforce that lead. It will lead to strong collaborations with overseas scientists, and provide access to major international facilities such as the Subaru telescope. Moreover, in line with Australian astronomy's strong track record of technology transfer, the innovations here will have great benefit in commercial areas such as remote-sensing, life-science imaging and space communications. The astronomical science produced — providing insight into our place in the universe, the formation of our own planet and the potential for life beyond our solar system — has a profound social impact, and informs Australia's broader perspectives going forwards.					
DE210100975 Mirkhalaf, Dr Mohammad	This project aims to develop ceramics that are simultaneously strong and tough, and to form them into complex shapes without compromising their mechanical properties – major challenges in science and engineering. Inspired by the internal architectures that confer these advantages on natural hard materials, it will produce novel ceramics with rationally-designed, highly-controlled dense architectures by developing a fast, scalable and versatile light-based 3D–4D printing technique combined with discrete element modelling. Outcomes will be toughened ceramics and new knowledge on processing-architecture-performance relationships, with significant benefits for biomaterials, defence, transport, high-temperature and aerospace applications.	69,462.50	139,425.00	138,425.00	68,462.50	415,775.00
	National Interest Test Statement Ceramic products are a multi-billion-dollar industry, with applications in biomaterial, protective armour, and high-temperature/harsh-environment systems. However, the performance and utility of existing ceramics is constrained by their brittleness. This project will result in novel classes of toughened ceramics with broader applicability across a more diverse spectrum of industries, positioning Australia at a very competitive position in research and development in high-performance ceramic materials, with flow-on economic and societal benefits. For example, metal implants currently used in the repair of damaged/diseased bone lack the tissue-regenerating capabilities of bioceramics but are preferred because they are tougher. By making tougher bioceramic implants, this project could improve outcomes for thousands of Australians and millions globally who suffer from bone conditions. Similarly, toughened ceramics will be significantly more impact-resistant than ceramics currently used in protective systems, such as body, vehicle and aircraft armours, providing clear advantages in these areas.					
DE210101085 Kimya, Dr Mert	This project aims to analyze the stability of multilateral agreements. This is expected to be done by building upon the cooperative approach in game theory that focuses on groups as the primary decision makers. Moving the unit of analysis from an individual to a group has the advantage of widening the applicability of game theoretic methods to social issues. Consequently, the project is expected to enhance our understanding of how and why cooperation can be sustained in some of the most pressing challenges faced by the society today that require extensive international collaboration to overcome, such as environmental change, trade disputes, and arms-control.	54,349.50	108,953.50	107,496.50	52,892.50	323,692.00
	National Interest Test Statement Many of the challenges faced by Australia require international collaboration through multilateral agreements to overcome. As an example consider environmental change, which is among the biggest challenges facing Australia today, as also identified by Scientific Priority Number 7. It is evident that this challenge must be tackled not just at the national level, but also through cooperation across international borders. Forging international agreements through the formation of stable coalitions would have to be an important aspect of achieving this outcome. To understand the complicated issue of forging international multilateral agreements, one needs to develop the tools needed to model and analyze such situations, which is exactly what this project aims to deliver. The project has the potential to provide significant benefits to both the Australian and international communities through the development of the techniques needed to study the stability of multilateral agreements and consequently by providing an understanding of how cooperation can be sustained in forging effective international agreements.					

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DE210101175 Bryant, Dr Gareth	This project aims to investigate policy models that account for public spending as an asset rather than a cost. The project expects to build knowledge about how changes in the way governments budget for and deliver funding create new options for public investment. The project develops a comparative study of the relationship between accounting reforms and financing models for higher education, social housing and renewable energy in Australia and the UK. Expected outcomes include conceptualising new spaces of fiscal power in the 'asset state' and developing tools for policy makers to guide budgetary choices. This should provide significant benefits by identifying equitable and sustainable ways to pay for critical services and infrastructure.	66,415.50	142,565.50	137,906.00	61,756.00	408,643.00
	National Interest Test Statement This project will provide benefits to the Australian community by seeking to address budgetary constraints in critical policy areas. Public investment in high quality higher education, social housing and renewable energy is essential for creating equitable, sustainable and productive economies and societies. The project will provide evidence to governments on how to effectively manage public finances to achieve these goals using innovative budgeting practices and policy models. This has the potential to offer significant benefits for Australia's economy, society and environment by assisting governments to create additional fiscal space for funding critical services and infrastructure. The project is designed to deliver on its benefits through engagement with policy makers, industry, end-users and other stakeholders in its research method, collaborations and outputs.					
DE210101176 Kaur, Dr Amandeep	The goal of this project is to develop chemical tools that enable molecular-level imaging of the amyloid structure. The Nobel Prize-winning super-resolution microscopy provides nanoscale imaging capabilities, but surprisingly there have been no substantive efforts to design fluorescent sensors that are compatible with this cutting-edge technology. In this project, new fluorescent super-resolution sensors will be developed that enable nanoscale visualisation of amyloid assemblies. These chemical and biochemical studies will establish rational design strategies to develop fluorescent sensors for super-resolution imaging applications and significantly advance our understanding of fundamental differences functional and toxic protein assemblies.	72,500.00	147,500.00	150,000.00	75,000.00	445,000.00
	National Interest Test Statement Super-resolution imaging is the exciting new technology that provides a molecular-level picture of cellular events, but the scope and application of this technology has been hampered by scarcity and poor quality of fluorescent tools compatible with it. This project will develop innovative fluorescent sensors for super-resolution imaging that will enable imaging functional and toxic protein assemblies with unparalleled resolution and expand our understanding of their role in health and disease. These sensors will also form the basis of precision medicine approaches where the nano-scale information of protein assembly is used to inform therapeutic regimens. The design rationale of these sensors will inspire the development of super-resolution imaging tools for the nano-scale visualisation of a myriad of biological events. Chemical sensors are routinely purchased by bioscience laboratories, reflecting the high commercial impact of this project which will provide benefits to the Australian economy and contribute powerful technological impacts across Australia's biomedical and agricultural industries.					
DE210101443 Webber, Dr Sophie R	This project investigates the social, economic and environmental impacts of large scale sand and water extraction to build protective infrastructure in vulnerable cities. Through a qualitative study of climate change hotspots in Indonesia and Fiji, this project will generate new knowledge about the potentials and limits of urban resilience infrastructure to protect cities against climate change. Expected outcomes and benefits include an evidence base to re-evaluate adaptation strategies and identify more sustainable alternatives for building urban resilience in the context of rapid urbanisation and climate change adaptation.	58,540.50	118,163.50	117,906.00	58,283.00	352,893.00
	National Interest Test Statement The threat of climate change and rapid urbanisation to cities of the Global South demands urban resilience infrastructure. This is particularly necessary in Australia's closest neighbours, Indonesia and Fiji, where flood mitigation measures may help prevent damage to millions of people, their communities, and assets. This study of the potential, limits and implications of extracting and consuming water and sand for building protective infrastructure and achieving urban resilience contributes to Australia's national interest by generating conceptual, empirical and policy-relevant knowledge about how to respond to climate change in growing cities. It will identify the negative impacts of building urban resilience infrastructure and propose measures for mitigating these impacts, creating a valuable evidence-based for planners, developers and policymakers. These practical insights are essential for future-proofing our region.					

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DE210101486 Grey, Dr Rosemary	This project aims to critically examine the international community's response to forced pregnancy and other crimes that violate reproductive rights, through a case study of the Khmer Rouge Tribunal in Cambodia. By analysing court documents and interviewing Tribunal lawyers, it expects to identify legal and practical barriers to prosecuting these crimes. It also seeks to provide the first comprehensive account of Khmer Rouge era reproductive crimes, to be made available on a public database that will shed light on this largely overlooked aspect of Cambodian history. Other expected outcomes include formulating new strategies for prosecuting reproductive crimes in international courts, thus contributing to the global push for gender justice.	76,158.00	141,816.00	138,810.00	73,152.00	429,936.00
	National Interest Test Statement Australia is a principal donor to the Khmer Rouge Tribunal and has identified accountability for sexual and gender-based violence as a priority for international courts. As a strong supporter of the international justice system, Australia has an interest in ensuring that this system is gender-sensitive and effectively upholds human rights standards for everyone. This project aligns with and will significantly enhance that interest, in identifying new strategies for prosecuting a type of sexual and gender-based violence that has until now been largely overlooked in international law (namely, reproductive crimes). This work will, in turn, help inform Australia's approach to reproductive crimes more generally in both domestic and international legal settings.					
DE210101593 Stadnik, Dr Yevgeny	This project aims to propose and assist in the development of novel approaches, based on atomic, molecular and optical technologies, to detect dark matter in the laboratory, and thereby establish the identity and microscopic properties of dark matter. The origin and nature of dark matter remains one of the most important outstanding problems in contemporary science. The intended outcome of this project is that the use of our novel methods will enable us to search for forms of dark matter that have remained largely unprobed to date. This in turn is expected to open up new opportunities in the global hunt for dark matter that should improve our chances of finally discovering the nature and properties of dark matter.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00
	National Interest Test Statement The primary benefit of this project will be through the expansion of our knowledge of the nature and properties of dark matter. This will benefit Australia's social and cultural fabric by invigorating the public's interest in fundamental science, as well as understanding the nature and workings of our Universe. The other benefits of this project will come from the fact that many of the newly proposed experiments to search for dark matter stemming from this project will be based around existing and developing technologies with numerous practical applications, including GPS navigation, magnetic resonance imaging (MRI scans), magnetic sensors and biosensors, and surverying for valuable resources and minerals. This synergy between numerous fields within applied science and technology and fundamental science will benefit Australia's economy, commercial activity, and society at large.					
DE210101619 Rawlings, Dr Victoria E	Gendered violence in schools is exceptionally common and damaging on both individual and community levels. Anti-bullying policies designed to reduce this violence have so far failed to make a meaningful difference. Using an innovative community-led research approach, this project aims to position school communities as experts on how gendered violence may be reduced. In partnership with four secondary schools across two states, this research project will be the first to enable students and teachers to investigate how school policies, spaces and activities influence gendered violence. It will produce evidence from the ground up about how different school communities can disrupt gendered violence in inventive and contextually appropriate ways.	67,074.50	141,733.00	146,521.50	71,863.00	427,192.00
	National Interest Test Statement Each day, students in schools around the country face verbal, physical and psychological violence based on what they wear, how they look, their interests, activities and speech. The vast majority of this is a feature of gender norms being policed. While some schools encourage acceptance and belonging, others resist acknowledging that gendered violence is a problem that confronts every young person in Australia, and extends far beyond graduation. This project uses community-led research methods to identify what works in building school cultures that celebrate difference and actively improve student and teacher experiences of schooling. It aims to work closely with school communities to identify when, how, and why gendered violence happens, and how their schools can work to disrupt it. This project has implications for broader anti-violence initiatives throughout Australia, including how the nation can reduce domestic and family violence through social and cultural change.					

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DE210101676 Fang, Dr Jianguang	This project aims to develop a new approach to design of new lightweight, crashworthy and manufacturable structures by taking advantage of the latest technologies in computational optimisation, artificial intelligence and additive manufacturing. The study intends to develop a new machine learning-based multiscale design framework to seek optimal triply periodic minimal surface structures, considering fabrication-induced defects and uncertainty. The expected outcome of this project is new methodologies for generating eco-friendly structures with robust mechanical properties in crashing applications. This should provide significant benefits to transport industries by enhancing structural safety and energy saving for next generation vehicles. **National Interest Test Statement** Australia nowadays consumes 160 ML petroleum every day, a 9.1% increase over the last five years. It has been shown that each 10% weight reduction leads to a 6-8% fuel saving in the automotive industry and 20% weight reduction results in a 10-12% fuel saving in the aerospace industry to reduce greenhouse gas emission. For this reason, lightweighting vehicles signify a vital area of research as energy crisis and environment concerns deepen recently. The project well aligns with this strategic area and will provide novel design and manufacturing approaches toward this goal. While significantly improved road safety over the last 40 years, road crashes remain a huge financial burden to Australia at over $30 billion per year, which is equivalent to 2% Gross Domestic Product (GDP). For this reason, the Australian government launched the National Road Safety Strategy (NRSS) 2011-2020. Vehicular crashworthiness and roadside barrier systems were identified as the key areas of improvement. This project perfectly fits NRSS and will benefit our society by providing better vehicles and safer road barrier systems.	72,807.50	145,479.50	145,037.50	72,365.50	435,690.00
DE210101896 Wang, Dr Xuehang	The fast-growing energy storage market demands new devices with both high energy and power density. This project aims to understand and then engineering electrode-electrolyte interfaces using novel two-dimensional (2D) materials to achieve accelerated ion transport and enhanced surface redox reactions. Advanced in-situ and ex-situ characterization tools, including X-ray scattering, neutron scattering, and terahertz time-domain spectroscopy, will be employed to study energy storage mechanisms. Novel solid-state batteries will be demonstrated based on well-designed electrodes using 2D materials. This project will boost the standing of Australia in the global competition of developing more efficient energy storage devices. **National Interest Test Statement** The project will benefit the Australian community with advanced electrochemical energy storage devices, which significantly improve energy and power performance. Such devices are capable of compensating the fluctuations from renewable energy sources, e.g. wind and solar powers, and provide stabilized high-quality electricity supply for high-end demand from both civil and industrial sectors. They will help to overcome challenges in the severe lack of hydropower in Australia and prevent the pollution of using fossil fuels. Moreover, because these new devices can be charged at much faster rates, and they have the potential to be commercialized and trigger new business opportunities in developing portable electrical energy storage devices, including personal mobile devices, automotive, mining, oil industry, military, and aerospace electronics.	75,012.50	146,475.00	143,425.00	71,962.50	436,875.00
	The University of Sydney	1,670,411.50	3,372,162.00	3,379,663.00	1,677,912.50	10,100,149.00
University of Technology Sydney						
DE210100158 Stein, Dr Jesse Adams	This project aims to generate a new history of Australian design and manufacturing, by turning attention to the shifting relationship between designers and manufacturing tradespeople from 1945 to 2007. In so doing, this project will re-evaluate design's transition to a globally-networked, digitised practice. Anticipated outcomes include a monograph, oral history interviews in the National Library of Australia's collection and a podcast. Expected benefits include an enhanced understanding of occupational pathways across Australian design, manufacturing trades and the creative industries, to inform understandings of skills shortages, retraining, and how best to support knowledge-sharing between designers and manufacturers in the future.	70,373.00	135,832.00	133,976.00	68,517.00	408,698.00

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	National Interest Test Statement This project aims to investigate the changing relationship between manufacturing trades and the design sector, so as to enhance understandings of the nature of work and collaboration in Australian design and local manufacturing between 1945 and 2007. Emphasis will be given to investigating workers' employment pathways between manufacturing, design, and the creative industries, in order to inform contemporary understandings of skills shortages, young people's career choices, worker retraining and technological adaptation. Anticipated outcomes include oral histories highlighting the voices of Australian tradespeople and designers, thereby addressing a gap in Australian oral history collections, which currently do not represent manufacturing trades or design in great depth. Expected benefits include a reframed understanding of technical expertise and creativity that can be applied to future work challenges, as well as new knowledge about the collaborative relationships between Australian designers and manufacturers, so as to support design innovation and manufacturing quality.					
DE210100494 Ueland, Dr Maiken U	The risk of global mass disaster events is increasing due to climate change and acts of terrorism. The most critical action following these events is locating victims. This proposal aims to develop an electronic nose capable of locating living and deceased victims by targeting volatile chemical components emitted from the human body. This project expects to overcome current limitations of current detection methods (e.g. cost, limited operational time, deployment constraints in hazardous scenarios). The expected project outcomes include the development of innovative techniques that will improve mass disaster recovery on a global scale and provide significant benefit to human welfare.	76,140.50	153,288.50	151,526.00	74,378.00	455,333.00
	National Interest Test Statement This research aims to improve victim recovery for both natural (e.g. earthquakes, volcanos, bushfires, tsunamis, hurricanes) and human-induced (e.g. acts of terrorism - explosions, arson, deliberate plane crashes) mass disaster events. Currently, there is a significant deficiency in reliable, accessible, and versatile methodologies used for the detection of entrapped victims. The rescue and recovery of both live and deceased victims is critical to human and social welfare. Additionally, the focus of creating a cost-effective instrument will allow for the electronic nose to be available to areas with limited resources. Thus, the proposed outcomes of this research will have profound social, economic, and welfare impacts both to the Australian and the international community. As mass disaster events are increasing both locally and globally due to climate change and the increased acts of terrorism, it is critical that research efforts are focused on aiding the victims, their family and loved ones and the impacted communities.					
DE210100512 Lin, Dr Wei	This project aims to develop the pioneering antenna technologies for far-field wireless power transfer (WPT) applications. New scientific and advanced engineering methodologies will be created to address the related fundamental technical challenges. Expected outcomes include the advanced multi-functional antenna arrays that will broadcast electromagnetic energy to remote IoT elements and the ultra-compact, highly efficient rectennas that will convert it to empower the sensor and communications functions seamlessly integrated into them. The intended first zero-waste battery-free wirelessly powered IoT ecosystems will support the realisation of the Australian Government's goal to pursue sustainable and environmental-friendly economic growth.	69,115.00	138,375.00	138,922.50	69,662.50	416,075.00
	National Interest Test Statement National think tank ACOLA has identified the benefits that Internet of Things (IoT) technology can deliver to enhance Australia's economy, environment and social wellbeing. The wirelessly powered IoT technology expected from this project will be pollution-free, leading to the development of environmentally friendly battery-free sensor networks and helping Australia limit the damage to the environment caused by electronic waste. The anticipated technology is uniquely suited for deployment in remote areas and will offer enhanced bushfire monitoring capabilities for parks and resource managers to protect Australian's valuable natural resources. Cable- and battery-free monitoring of pipe health in water systems is another expected application of the technology, significantly reducing maintenance costs for water and other utility providers. With Australia's 5G development, the project outcomes will also facilitate the digitalisation of the agriculture sector through more sustainable real-time monitoring of temperature, air humidity, soil pH, and other variables to better manage relevant scarce resources.					
DE210100651 Dinh, Dr Hoang T	This project aims to develop novel technologies empowered by intelligent radio wave backscatter to address the significant problem of connecting a very large number of wireless devices with low energy consumption and limited communication channels for future Internet-of-Things (IoT) networks. This project expects to advance knowledge in the area of green communications by utilising ambient backscatter, a breakthrough wireless communications technology. This will significantly reduce energy costs, enhance spectrum usage efficiency, and improve communication security thus greatly benefiting Australian industry, society and economy. Expected outcomes of the project include key technologies that promote the development of future IoT networks.	69,000.00	138,000.00	138,000.00	69,000.00	414,000.00

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	National Interest Test Statement The outcomes of the project will provide advanced knowledge in the area of low-cost wireless communications by utilising ambient backscatter, a recent breakthrough communications technology. This technology enables two wireless devices to communicate by leveraging surrounding radio signals. Hence, it does not require any internal energy on the devices and costly infrastructure deployment, e.g. base stations, as in conventional mobile networks. As a result, the project will assist Australia to pioneer in the field of high-tech industry development for Internet-of-Things (IoT), thereby making Australian industry more competitive in the global IoT market and enabling creation of new high-value jobs in the manufacturing and services sectors. The project will also pave the way for a new era of batteryless IoT devices which eliminate battery production cost and significantly reduce hazardous battery waste for the environment. Finally, the outcomes of the project will promote a new type of commerce, called IoT-Commerce, which is increasingly dominating conventional commerce services, e.g. e-Commerce and m-Commerce.					
DE210100755 Irga, Dr Peter J	This project aims to develop, evaluate and apply a range of biotechnology driven solutions for the use of phytosystem biofilters designed for air purification. The findings of the project will demonstrate the fundamental mechanisms behind botanical air pollutant biofiltration, apply systematic technological development against a range of air pollutants, and provide strategies to deploy the technology. With a transdisciplinary approach utilising techniques new to this discipline, the project will substantially advance the fundamental science underlying this novel and highly valuable area of air-bioremediation technology, and will create a much stronger economic driver for this Australia-led innovation.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00
	National Interest Test Statement Urban air pollution is an emerging worldwide health concern. As our cities experience increasing population and traffic densities, and as bushfires increase in frequency and severity, Australia is facing an impending air quality crisis. This project tackles this challenge. It will develop innovative biological air cleaning technology that is cost-effective, sustainable, and capable of removing a greater range of air pollutants at lower energy use and lower maintenance than any current air filtering technology. Improved indoor air quality for inhabitants within and close to commercial, industrial and transport infrastructure settings will facilitate healthier, more environmentally and economically sustainable built environments and, over time, will contribute to governmental climate adaptation strategies by informing future planning policy on urban form and resilience. Implementation of the project's new air filtration technologies will create new markets and stimulate job growth, delivering significant economic benefits to Australia as well as cementing our position as a leader in this emerging industry.					
DE210101382 Zhao, Dr Liya	The project aims to generate a fundamental understanding of the underlying multiphysics of dual-functional locally resonating metastructures, where undesirable vibrations are suppressed while absorbed energy is converted into electricity. It will widen low-frequency vibration suppression gaps and maximise energy capture by formulating an integrated modelling framework to leverage complex dynamics of nonlinear local resonators coupled with vibration energy harvesting mechanisms and nonlinear electrical circuitry. This will promote the development of next-generation multifunctional metastructures. Knowledge produced should improve the durability of structural components and empower sustainable wireless monitoring with self-powered sensors.	72,962.50	142,925.00	139,925.00	69,962.50	425,775.00
	National Interest Test Statement This project will provide new technology that can simultaneously suppress harmful environmental vibrations while converting the dissipated vibration energy into useful electricity. The project outcomes will underpin the design and development of next-generation tailored materials and structures, placing Australia at the forefront of research in both vibration suppression and renewable energy harvesting. More cost-effective vibration control methods will enhance the safety and durability of plates and beams in buildings and civil infrastructures, potentially saving billions of dollars in maintenance costs for Australia's construction sector. The energy harvesting technique will support development of self-powered sensor networks. This will benefit Australia's society, environment and economy by enabling sustainable structural and environmental monitoring, reducing chemical pollution of battery waste, and advancing Australia in the emerging global economy of self-powered Internet of Things devices.					
DE210101808 Gandomi, Prof Amirhossein	The project aims to extend a powerful machine learning method, called genetic programming and also developing a new concept called Alpha program, for big data analytics. This project expects to generate a new approach by finding a systematic approach to develop gene structures using information theory. By borrowing the best genes from the population of programs, the Alpha program concept will be developed for the first time. The proposed approach aims to enhance genetic programming for many practical problems. I contend that not only finding better tools for big data analytics is in the best interest of machine learning and big data communities, it also provides significant benefits for other communities and industries in Australia.	65,962.50	131,925.00	131,925.00	65,962.50	395,775.00

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	National Interest Test Statement Australian government and businesses generate huge volumes of data, growing exponentially, yet still lack tools sophisticated enough to translate this interconnected information into specific and actionable knowledge. The sophisticated tool of this project will provide a springboard to develop artificial intelligence (AI)-based solutions that will offer unprecedentedly powerful (in terms of accuracy, reliability, and required time) yet transparent insights into big data, enhancing the decision-making capabilities of a broad range of stakeholders in Australia –from health and finance policymakers through to civil engineering firms. Australian government think tanks have identified data science as a knowledge priority critical to Australia delivering a strong, safe and inclusive digital economy. Outcomes from this project directly support Australia in making this transition. The developed tool will enhance capabilities to develop and supply AI products globally in Australia's research priority areas of finance, environment, and cybersecurity, delivering significant economic and social benefits.					
	University of Technology Sydney	500,711.50	994,661.50	988,590.50	494,640.50	2,978,604.00
University of Wollongong						
DE210100053 Lee, Dr Richmond	Computational chemistry will be used to discover and predict new halogenophilic (halogeno = halogen; philic = like) substitution reactions (SN2X) catalysed by positively charged (cationic) catalysts. SN2X is a less known substitution reaction compared to accepted textbook nucleophilic (nucleo = electron-rich) substitution reactions. This proposal capitalises on previous theoretical-experimental understanding of a cation-catalysed SN2X to develop new chemical reactions using SN2X synthetic strategies to access difficult-to-make molecules of potential medicinal relevance with heavily substituted carbon-carbon and carbon heteroatom bonds.	69,872.50	141,407.50	144,482.50	72,947.50	428,710.00
	National Interest Test Statement Computational modelling of catalytic process' mechanism and the ability to control reactions are important undertakings that can pave new developments in modern chemistry. Based on our breakthrough study published in Science 2019 I will pursue the development of new synthetic methods, first through computational chemical modelling and design then experimental testing, to allow the construction of difficult-to-make but important molecules. From the point of view in fundamental science, this project will discover new reactions and impact how chemical reactions are taught at the undergraduate level. From the point of view of applied chemistry, this project will meet the ever-growing demand for novel catalysts and will contribute significantly to the development of new therapeutic agents. Thus, the outcome of this DECRA project will contribute significantly to Australia's pharmaceutical and chemical industries.					
DE210100157 Jankowski, Dr Nathan R	The primary aim of this project is to systematically construct a high-resolution record of landscape and vegetation change within the Willandra Lakes Region World Heritage Area over the past 50,000 years. Using state-of-the-art dating techniques and a multidisciplinary approach, this project will provide critical environmental context for the region's world-famous archaeological record, charting the environmental changes that occurred as NSW's largest inland lake system ran dry at ~15,000 years ago. Anticipated outcomes include a refined understanding of: the drivers, timing, and periodicity of lake desiccation; the influence these changes had on regions landforms and vegetation; and how this impacted the lives of people living here.	77,077.50	154,202.00	154,272.50	77,148.00	462,700.00
	National Interest Test Statement This project, set within the Willandra Lakes Region World Heritage Area (WLRWHA), will have significant environmental and cultural benefits to the Australian community. By constructing a high-resolution framework of landscape, hydrological and vegetation changes between 50 and 15 thousand years ago, this project will strengthen the WLRWHA's geological heritage values that, up until now, have remained poorly constrained and understood. Furthermore, the integration of this projects geological findings with the archaeological record of the Willandra, will strengthen the cultural heritage values and allow for a deeper understanding of the the Willandra's settlement history over this time period. Finally, this work is conducted in partnership with, and support of, the WLRWHA Aboriginal Advisory Group and will strengthen their cultural connection to Country and aid in the development of Care of Country policies and procedures.					

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DE210100812 Silla, Dr Aimee J	This project aims to address the global biodiversity crisis by incorporating evolutionary theory into the study of reproductive technologies. With 41% of amphibian species now threatened with extinction, this project expects to revolutionise the field, enhancing the propagation and genetic management of threatened amphibians. Specifically, incorporating evolutionary theory into the study of amphibian reproductive technologies will increase our capacity to predict spermiation responses and identify parental-genetic incompatibilities that may compromise offspring viability. Ultimately, this novel approach will provide significant benefits by fast-tracking the development of reproductive technologies for threatened species recovery.	73,132.00	148,956.50	152,742.00	76,917.50	451,748.00
	National Interest Test Statement Proactive interventionist conservation actions are urgently required to assist amphibian species recovery and decelerate declines. Using evolutionary theory to fast-track the development of reproductive technologies will be crucial for maximising the integrity and long-term viability of amphibian conservation breeding programs. Advancing the efficiency with which conservation managers are able to propagate and genetically manage Australia's critically endangered amphibians will directly contribute to a key Science and Research Priority: 'Environmental Change'. In particular, this DECRA fellowship will develop powerful predictive models and rigorously test cost-effective, practical technologies for managing captive assurance populations of Australia's most critically endangered amphibian species. Ultimately, research outcomes will address a practical research challenge by providing the tools required for responding and adapting to the impacts of environmental change on biological systems.					
DE210100989 Carr, Dr Chantel	Industrial and resource regions that have felt the effects of automation and economic adjustment for decades now face an imperative to transition out of carbon intensive industries. This project aims to address household capacities to mediate and plan for this new challenge which is already reconfiguring working life in regional Australia. The project will use qualitative methods to understand how industrial change and working futures are negotiated in spaces beyond the workplace, and how this might contribute to socially just transitions. Outcomes include an empirical evidence base that will produce novel insights into the types of support households will require to negotiate future work transitions.	76,957.00	154,115.00	149,113.00	71,955.00	452,140.00
	National Interest Test Statement Regional workers across Australia have been on the front line of structural transformation for at least 40 years. While experiences of redundancy are often the most critical point of transition, less is known about how workers and their households negotiate longer-term, ongoing change, especially in industries that remain vulnerable to global forces. Amidst challenges such as automation and concern for the environment, this project seeks to examine the experiences of coal workers and their families in a test-case region in which households have long negotiated the patchy, partial and uneven nature of regional transformation. The project uniquely situates workers within the context of the household unit to reframe how work and the future are made sense of beyond the workplace. The research will benefit Australia by enabling governments, institutions and employers to better understand the values and needs of regional worker households, and their capacities to participate in transitions to more just and sustainable futures.					
DE210101073 Tang, Dr Shiyang	Conductive elastic composites are one of the key components used in flexible/wearable electronic devices in the manufacture of sensors and interconnects; however, conventional composites experience a relatively low sensitivity to strain, and their conductivity decreases when stretched (i.e. they exhibit a negative piezoconductive effect). This project aims to understand the unprecedented positive piezoconductive effect exhibited on the liquid metal-embedded hybrid elastomer (LMHE) and explore its potential to address the key challenges faced by conventional materials. The outcomes of this project will benefit the advanced manufacturing sector by developing high-performance composites to revolutionise future wearable electronic technologies.	67,500.00	122,500.00	110,000.00	55,000.00	355,000.00
	National Interest Test Statement The unprecedented electronic and mechanical properties exhibited on the proposed conductive composites will address the shortcomings of conventional flexible electronic materials in the manufacture of sensors and conductors. Thus. this research will improve the performance, versatility, functionality, and robustness of soft conductive composites to advance the fields of flexible and wearable electronics. Since the advancement in wearable technology has the vast potential to extend the range of health care systems into the community and maximise individual participation, the ultimate goal of our research is to offer a reliable and sustainable solution that will enable the industry to develop high standard and cost-effective wearable devices for health monitoring. As such, the knowledge and technology gained from this project will benefit Australian industry and contribute to the healthcare system, as well as strengthen Australia's current standing as a world leader in material sciences, health systems engineering, and advanced manufacturing.					

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DE210101384 Schotsmans, Dr Eline M	The main aim of this project is to investigate complex multi-stage mortuary practices through the integration of archaeo-anthropology, forensic science and ethnology. The methodological principles of funerary archaeology will be expanded by experiments at the only Australian and Canadian body farms, and integrated into the study of Neolithic Near Eastern burials. Combined with ethno-archaeological research in Indonesia, anticipated outcomes include new methods for the study of multi-stage mortuary processes, together with refined knowledge about social differentiation and ideology in the world's first proto-urban settlements. This study will emphasise Australia's pioneering role in combining archaeo-anthropology with forensic science. **National Interest Test Statement** This project will deliver outcomes in Australia's national interest through social and cultural benefits spanning the sciences and the humanities. Frontier research at Australia's only body decomposition facility will produce results of immediate benefit to forensic science that are directly applicable to medico-legal contexts and police work in Australia. This pioneering interdisciplinary project will also reveal novel insights into the archaeology and anthropology of how past societies treated their dead, a topic of enduring interest to different cultures, both in Australia and around the world. In particular, the research findings will enhance our appreciation of the rich cultural heritage of Indigenous Australians by advancing our knowledge of early mortuary practices and the application of ochre to human remains. The cross-cultural nature of the study also offers a unique means to engage with the Australian public on conversations that can be problematic for many people, especially the elderly, and to view sensitive issues such as body donation through the lens of ancient and modern cultural practices.	76,158.00	146,870.00	143,964.00	73,252.00	440,244.00
	University of Wollongong	440,697.00	868,051.00	854,574.00	427,220.00	2,590,542.00
Western Sydney University						
DE210100639 Fitts, Dr Michelle S	Domestic and family violence that leads to traumatic brain injury is a significant disability concern, yet, little is known about the intersection of the two for Indigenous Australian women. They experience unacceptably high rates of head injury, 69 times higher than other Australian women. Qualitative exploration with Indigenous Australian women with traumatic brain injury, their families and the services who support them will seek to bridge the gap between research and practice and help inform the service delivery of disability, health and family violence agencies. The research will result in a body of work that explores their daily lives to understand the cultural, geographical, psycho-social needs and nuances of their lived experiences. **National Interest Test Statement** This project will explore the experiences of Indigenous women returning home from hospital after a traumatic brain injury related to family violence. The six-month period following discharge from hospital is critical after such an injury. This period is associated with a range of physical, psychosocial and participation challenges. The project aims to build a body of work examining (a) how Indigenous women re-engage with community and return to activities and responsibilities, and (b) offer insights into the challenges they experience including barriers to support. This evidence will be vital for Australia's disability and family violence services. Through policy and agenda-setting outputs, the project will improve (a) how services can respond to the psychological, cultural, and family needs of Indigenous women with disability, (b) the resources for brain injury survivors, and (c) how government can design suitable systems for Indigenous women. This would help to provide social and community benefits by producing more efficient services, and improve the lives of Indigenous women with disability.	73,500.00	149,500.00	147,750.00	71,750.00	442,500.00
DE210101654 Jiang, Dr Mingkai	Rising atmospheric CO2 and the associated changes in rainfall regimes are rapidly reshaping how Australia's forest ecosystems function and underpin our daily life. Whether Australia's native Eucalyptus trees can withstand the impacts of climate extremes such as drought and heat under rising CO2 is a crucial question that this project aims to resolve. Using an innovative framework that integrates novel knowledge, data assimilation and ecosystem modelling, this project will provide critically needed evidence to disentangle the multifaceted impacts of climate change to Eucalyptus trees. This will help reduce the predictive uncertainty in assessing the vulnerability and resilience of Eucalyptus forests in the changing Australian landscape.	54,215.50	110,396.00	113,548.50	57,368.00	335,528.00

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	National Interest Test Statement Using an innovative research framework that integrates novel and synthesized knowledge gathered from manipulative experiments, data assimilation, and process-based modelling, this project will provide the critically needed capacity to disentangle the interconnected and interdependent elements of climate change impacts to Australia's native Eucalyptus trees. The output of this research will directly contribute to Australia's national forest assessment, leading to improved predictive capacity to quantify Australia's forest vulnerability and resilience to climate change. In turn, this research will provide a better understanding of the sustainable limits of our terrestrial ecosystems in a changing world, thereby providing options for responding and adapting to the impacts of environmental change to ensure long-term sustainability.					
DE210101662 JIANG, Dr Cheng	The application of fibre reinforced polymer (FRP) composites in structural rehabilitation is sometimes challenged or opposed due to the limitation of its fire resistance. This project aims to solve the fire resistance problem of FRP in column jacketing work using innovative approaches. The proposed scheme will be developed by using advanced materials and mechanical fastening technology. It can ensure structural serviceability of FRP jackets during a fire. And after the fire, the proposed jacketing scheme is reusable by applying a new layer of epoxy. The project is expected to advance the theory and technologies in structural rehabilitation. It will also provide significant benefits to the construction industry via sustainable construction.	65,508.00	134,072.00	132,971.00	64,407.00	396,958.00
	National Interest Test Statement Infrastructure in Australia has long suffered from deteriorations due to steel corrosion. In Australia, corrosion costs over $32 billion a year -- about 2.1% of GDP in the country. The use of noncorrosive fibre reinforced polymer composite materials will offer more sustainable infrastructure through improved durability and the reduced need for maintenance, thereby contributing the structural longevity. Based on the research in this project, the decreased required insulation thickness, the post-fire reusability, and the reduction of column jacketing region of this proposed rehabilitation scheme will lead to savings in construction materials and labour costs. This can help to reduce material usage in construction projects and conserve natural resources, which indirectly reduces greenhouse gas emissions by the construction industry. This new technology would create new business opportunities and commercial benefits, and would also require additional skilled labour and trained professionals thus producing many new job opportunities, with economic benefits for Australia.					
DE210101738 Dai, Dr Shi	Finding radio pulsars has always been an extremely rewarding challenge and has led to Nobel Prize winning science. We are now entering a new era of radio astronomy and have new game changers, sensitive, wide-field-of-view imaging telescopes and massive compute resources, to search for extreme pulsars. Such pulsars, including pulsar-blackhole systems and sub-millisecond pulsars, cannot be found with traditional pulsar surveys, but provide us unique laboratories to test gravity theories at ultra-strong gravitational fields and probe the state of matter at supra-nuclear densities. In this project I will leverage the Australian Square Kilometre Array Pathfinder (ASKAP) to discover the most extreme pulsars in deep all-sky continuum surveys.	57,500.00	115,000.00	115,000.00	57,500.00	345,000.00
	National Interest Test Statement This project will leverage significant benefit from the Government's multimillion dollar investment in the Australian Square Kilometre Array Pathfinder (ASKAP) operation and strengthen the impact of the Australian Space Agency project on the lives of all Australians. Radio astronomy has a distinguished track record of pushing technology beyond the boundaries and has produced spin-offs such as Wi-Fi, aircraft landing systems and imaging algorithms used in medical CT and MRI scanners. This project will progress a vital section of ASKAP's mission and tread the same path as these earlier successes to develop innovative techniques for deep space exploration. The techniques are destined to uncover significant new knowledge and contribute to the economic development of Australia through downstream application of newly generated intellectual property and the initiation of commercial spinoff opportunities. This project will enhance Australia's global reputation as a leading investor and capacity builder in the future civil space workforce.					
DE210101822 Egidi, Dr Eleonora E	Drought threats grasslands worldwide, and new adaptation and resilience building approaches are required to protect the wealth of ecosystem services provided by grasslands. Soil microbes offer an untapped opportunity to enhance drought survival in grasses. Yet, to harness this potential, we first need to identify the key microbial functions that contribute to plant tolerance to drought. This project aims to determine the microbe-mediated ecological and functional mechanisms that underpin grass performance under drought. This knowledge will lay the foundation to accelerate the design and implementation of effective microbial manipulations and management strategies, and thus increase our success in protecting this important ecosystem.	72,158.00	143,606.00	147,056.00	75,608.00	438,428.00

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	National Interest Test Statement					
	Grasslands, one of the spatially and economically most important biomes of Australia, is under threat from climate change. This project will provide major socio-environmental and economic benefits to the primary and environmental sectors by providing critical knowledge for the development of improved microbe-based tools that sustainably increase the resilience of grasses to climate change. These benefits will be relevant to: (i) seed and bioinoculant industries, who get precise information on microbial functions to be targeted for improved plant performance; (ii) pasture and livestock farmers, who will increase the resilience of their grass supplies under climate change; (iii) policymakers, who get better theoretical frameworks and models to monitor and predict particular grasses/ecosystems that are more vulnerable to drought stress due to loss of beneficial microbes; Key stakeholders will be engaged through policy briefs, input to expert groups via workshops, and media and press releases.					
	Western Sydney University	322,881.50	652,574.00	656,325.50	326,633.00	1,958,414.00
	New South Wales	4,960,448.50	9,973,071.50	9,968,343.00	4,955,720.00	29,857,583.00

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Queensland						
Central Queensland University						
DE210100273 Wu, Dr Qing	This project aims to understand the contributions of railway train forces to a dangerous and high-cost track dynamic behaviour called buckling; by developing a supercomputing method that unlocks the capability for large-scale 3D train-track interaction research for railway trains of up to 250 vehicles. This project expects to generate new knowledge regarding track buckling, train derailments and train-track dynamics. Expected outcomes include a new supercomputing method for train-track dynamics and derailment research and a science-based technique to assess track buckling safety. This project should provide significant benefits to the rail industry including enhanced rail safety, lower maintenance costs and improved transport efficiency.	67,637.50	135,366.00	136,202.00	68,473.50	407,679.00
	National Interest Test Statement Australian rail transport contributed 1.8% of Australian GDP in 2018; it is also the primary land transportation mode for mining exports which accounted for 72% of Australian exports in the same year. Recognising the increasing importance of both passenger and freight rail to Australia, the federal and state governments are committing ~$100 billion over the next decade to address the country's growing needs in rail. These needs are driven by continuing growths of the Australian population and freight volume, and the rising demand for safe and fast delivery of Australian produce and commodities to domestic and international markets. To support these needs, a safety and efficiency critical research gap regarding track buckling will be researched in this project by developing a new 3D train-track dynamics research method on supercomputers. The research outcomes have great potential to enhance rail safety and productivity which are essential to Australia's national interests.					
	Central Queensland University	67,637.50	135,366.00	136,202.00	68,473.50	407,679.00
Griffith University						
DE210100113 Tzoumakis, Dr Stacy	This project aims to investigate how early family, individual, and school factors can be targeted to prevent victimisation and offending among vulnerable male and female young people. This project expects to generate new knowledge on: 1) gender-specific risk and protective factors of victimisation and offending; and, 2) the effectiveness of school-based social-emotional learning programs for males and females. Expected outcomes include advancing developmental life-course theories for female offending. This project should provide significant social and economic benefits for policymakers on how to most effectively prevent male and female young people's involvement with the criminal justice system.	70,498.50	140,997.00	140,831.50	70,333.00	422,660.00
	National Interest Test Statement By helping to effectively identify and support young people and their families prior to becoming enmeshed in the criminal justice system, this project has strong potential to benefit government and taxpayers by reducing the enormous costs of the Australian justice systems (estimated at 16 billion annually). Since individuals with early, frequent, and persistent contact with the criminal justice system are also frequent users of other government services such health, welfare, employment, and other social services, there is also strong potential to reduce the financial costs more broadly. Beyond the tangible economic benefits, preventing victimisation and offending has important social benefits to individuals, young people, families, peers, schools, communities as well as Australian society. Determining which early risk and protective factors of offending and victimisation trajectories to target by gender will help to inform the development of effective preventative interventions for vulnerable youth.					
DE210100692 Zhang, Dr Jun	Separation of particles and particularly cells is an indispensable process in disease diagnostics, chemical/biological assays and food/chemical industries. This project aims to study the interplay between inertial fluid flow, electricity, and magnetism in microscale for particle separation. The project is expected to establish the fundamental theory underpinning the development of the proposed advanced separation technology. This disruptive technology is expected to enable the unique, high-performance and high-throughput separation of particles such as cells. The technology will potentially benefit the biomedical and pharmaceutical industries, providing economic opportunities and maintaining high-quality healthcare for Australia.	70,000.00	140,000.00	140,000.00	70,000.00	420,000.00

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	National Interest Test Statement This project is expected to deliver theoretical and experimental breakthroughs in hybrid inertial microfluidic technology and their innovative application on diagnosis of diseases such as cancer. Cancer is a major cause of death in Australia and all over the world. Early detection and reliable monitoring of disease are the two key factors for cancer therapy. The traditional diagnostic method - tissue biopsy can only be applied when the cancer is developed and symptoms are obvious. Liquid biopsy through circulating tumour cells (CTCs) enables easy access to tumour information for diagnosis, prognosis and targeted treatment. The proposed platform technology can be applied for efficient CTCs isolation by multi-criterion screening. This project is expected to develop a cutting-edge technology for cell separation in chemistry, biology, and medicine, and the outcome will enhance the research capability of Australian biomedical and pharmaceutical industries. The know-how and intellectual property resulting from this project will provide further economic opportunities and better healthcare to Australians.					
DE210101102 Dou, Dr Yuhai	Single-atomic sites supported on graphene analogs is an ideal structural mode for the design of electrocatalysts due to its ultimate small size limit, atomic thickness, and easily tuned electronic properties. This project aims to use a theory-guided approach to develop efficient electrocatalysts for the production of value-added hydrogen peroxide. The structural advantages of graphene analogs will be fully utilised to unlock the catalytic power of single-atomic sites, and consequently achieve high catalytic activity and selectivity. The outcome will set a solid scientific foundation to enable economically viable technologies for eco-friendly hydrogen peroxide production and bring significant socioeconomic benefits to Australia.	67,458.00	134,916.00	134,916.00	67,458.00	404,748.00
	National Interest Test Statement Hydrogen peroxide is a key chemical for a range of industrial sectors. Its production via the anthraquinone process, however, relies on fossil fuels and is energy intensive. This project takes the challenge to develop atomically thin nanomaterial supported single-atomic-site catalysts for 2e-ORR, which will set a solid scientific foundation to enable economically viable technologies for eco-friendly hydrogen peroxide production. Moreover, the project is at the forefront of emerging catalysis science and technology, and therefore its success will advance knowledge in these fields and enhance Australia's global reputation. More importantly, this project directly addresses the Australian Government Science and Research Priorities: Advanced manufacturing - Cross-cutting technologies that will de-risk, scale up, and add value to Australian manufactured products. The cutting-edge science and technology developed by this project will enable Australian chemical engineering industries to meet the challenge of advanced manufacturing, providing significant socioeconomic benefits to Australia.					
	Griffith University	207,956.50	415,913.00	415,747.50	207,791.00	1,247,408.00
James Cook University						
DE210101087 Lambrides, Dr Ariana B	This project aims to document the role of Aboriginal and Torres Strait Islander people in shaping the fish resources of the Great Barrier Reef over millennia. Using novel analyses of archaeological faunal remains, this project expects to generate new knowledge on how people's actions transformed marine systems and modified fish communities. Expected outcomes include establishing pre-European baseline data essential for managing contemporary fish populations, and a long-term perspective on human exploitation of a dynamic Great Barrier Reef. Benefits include a framework for integrating Indigenous fisheries management into conservation agendas and foregrounding the deep human history of the Reef to support future social-ecological resilience.	75,535.50	146,999.00	146,605.00	75,141.50	444,281.00
	National Interest Test Statement This project will generate comprehensive archaeological records of the role of Aboriginal and Torres Strait Islander people in shaping the distribution and abundance of fish communities across the Great Barrier Reef. This project aims to assess human-coral reef interaction over thousands of years and emphasise the deep Indigenous history of the Great Barrier Reef and the importance of these connections to Country for supporting the future outlook of the region for all Australians. This proposed research program is expected to provide long-term baseline data essential for managing contemporary fish populations, strengthen knowledge of Australia's cultural heritage, and enhance research networks to support ongoing research on human-environment interaction. In doing so, this project addresses key research priorities in Australia's National Marine Science Plan and the Great Barrier Reef Marine Park Science Strategy, which benefits the >$6 billion per year fisheries and tourism industries and stakeholders that rely on future reef health.					
DE210101344 Meehan, Dr Michael M	Emerging infectious diseases and antimicrobial resistance are among the greatest threats to Australian health and agriculture, and current surveillance tools may fail to detect and mitigate infectious disease outbreaks in real time. This project will develop advanced phylodynamic methods (i.e., mathematical models of infectious disease transmission and pathogen evolution) to enable real-time surveillance of infectious disease outbreaks as they emerge and monitor levels of drug resistance.	68,024.50	130,332.50	114,466.00	52,158.00	364,981.00

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	National Interest Test Statement From public health through to agriculture, Australian industries are increasingly turning to genetic sequencing to improve their preparedness and response efforts to emerging infectious diseases. The modelling methods and tools developed in my project will help facilitate real-time tracking of infectious diseases and enable rapid responses to ongoing and emerging outbreaks in plant, animal and human species. The early identification of transmission clusters will allow for targeted and efficient response efforts that promise to decrease costs associated with outbreak control. These tools can also be used to monitor rises in drug resistance and outbreak strains of critical diseases, flagging outbreaks, detecting changes in geographic reach and changes in transmission patterns. Moreover, by allowing rapid and precise public health intervention and rapid assessment of response, my project addresses precisely the activity that was viewed as under-developed by the recent WHO health security assessment of Australia.					
DE210101383 Willis, Dr Anna C	The aim of this project is to examine isotopes in the teeth of individuals from three sites in prehistoric central Myanmar to examine diet, the movement and migration of people, and potential patterns in post-marital residence, which are all intricately linked. Built on a strong conceptual framework this project seeks to generate new information in the field of archaeological science. The research outcomes of this project will expand our current archaeological knowledge of this focal but under-researched area, which will be of particular benefit in understanding Myanmar in relation to surrounding regions and the wider Southeast Asian context, and in fostering continued collegiality and collaboration with Myanmar scholars and communities.	72,588.50	144,598.00	143,888.00	71,878.50	432,953.00
	National Interest Test Statement This research contributes to Australia's national interest through its potential to provide social benefits to the Australian community. The application of the techniques utilised in this project would have significant benefits in the field of contemporary forensics in Australia. Examining different isotopes in the teeth can provide information about where an individual was born, and what their diet was. This information can assist identifying people, and would be valuable in historical cold cases where other avenues of investigation were unsuccessful, or in investigations of fallen Australian soldiers from the world wars, whom are often difficult to identify or differentiate from non-Australians if there are no personal artefacts associated with them.					
DE210101395 McCoy-West, Dr Alexander J	This project will use a range of innovative geochemical techniques to constrain the timing and extent to which the continents were emergent (above sea-level) throughout Earth's history and its impact on climatic evolution. Continental emergence was pivotal to the development of our habitable planet, as it controlled the influx of bioessential elements, like phosphorus, to the oceans. Expected outcomes include a detailed record of changes in ocean chemistry, and a time integrated model for the emergence of continents on the early Earth. Documenting the impact of changes in the solid Earth on evolution is not only of interest to society in general, but also contributes to understanding the formation of Australia's vast iron ore deposits.	74,613.00	149,201.00	149,200.50	74,612.50	447,627.00
	National Interest Test Statement There is no more fundamental issue than to understand Earth's history and how it has evolved to form the habitable environment we rely on. This project will provide new insights into the conditions on planet Earth during the emergence of complex life. The development of life had a fundamental effect on the redistribution and oxidation of metals in the environment, thus indirectly this project will also lead to a better understanding of why abundant iron-manganese ore deposits formed around this time. This project is based around the development and application of novel isotope techniques. Investing in analytical development like this could open the door on solutions for a diverse range of problems in the future, for example, characterising ore bodies for mineral exploration, or fingerprinting pollutants in environmental studies.					
DE210101918 Gurney, Dr Georgina G	This project aims to determine the conditions under which coral reef protected areas are likely to be considered fair by local stakeholders and how perceived fairness is related to cooperation with management. With protected areas set to cover 30% of the world's surface by 2030, addressing the understudied question of what constitutes fairness for stakeholders is of pressing importance. This project will conduct the first multi-country comparative analysis of perceived protected area fairness, the factors that shape those perceptions and their implications for cooperation with management. Project outcomes include enhanced capacity to plan for and inform effective protected areas that are considered fair by the people most affected by them.	73,238.50	145,010.00	135,756.50	63,985.00	417,990.00

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	National Interest Test Statement Equitable management of protected areas is a requirement stipulated in international conservation agreements, including the Convention on Biological Diversity, to which Australia is Party. Fair conservation is not only an ethical imperative, but is recognised as instrumental to achieving conservation because perceived unfairness can foster conflict and undermine stakeholders' support, cooperation and compliance. But, understanding of what constitutes protected area fairness for stakeholders is lacking. This project aims to determine the conditions under which coral reef protected areas are considered fair by local stakeholders and how perceived fairness affects cooperation with management. The research will be carried out in Fiji, Indonesia and Australia (Great Barrier Reef, Ningaloo Reef). Project outcomes will provide direct guidance to managers on how to implement effective protected areas that are considered fair by the people most affected by them, which will help Australia meet its international commitments and ultimately, contribute to combating the rapid loss of coral reefs in our region.					
DE210101924 Bergseth, Dr Brock J	This project aims to determine how fisheries compliance can be improved with behavioural interventions. Poaching is the most tenacious problem hindering sustainable fisheries worldwide, yet efforts to reduce non-compliance often fail due to limited understanding of how to influence behaviour. This project will draw on key theories and methods from behavioural science to empirically assess how social norms interventions influence fisher compliance in a range of coral reef fisheries. This will significantly improve our understanding of how to lever psychological, social, and cultural dimensions to reduce poaching. Ultimately, this project will contribute practical guidance to influence behaviours in fisheries and other environmental contexts.	77,133.00	154,141.00	153,766.00	76,758.00	461,798.00
	National Interest Test Statement Poaching, or illegal fishing, regularly negates the effectiveness of the world's marine protected areas. For example, illegal fishing has consistently been identified in the last decade as a significant threat to Australia's World Heritage-listed Great Barrier Reef Marine Park. Reducing poaching is therefore of critical importance both in Australia and in strategic, regional partner countries such as Indonesia and Papua New Guinea. This project will use innovative research to assess how social norms-based behavioural interventions can influence fishers' compliance behaviours. These insights will increase our understanding, and subsequent ability, to influence human behaviour in fisheries and other contexts such as environmental crime. More broadly, this knowledge and practical guidance will be directly applicable to reducing other illegal behaviours currently impacting Australia's environment, such as illegal dumping, littering and unauthorised land clearing.					
	James Cook University	441,133.00	870,281.50	843,682.00	414,533.50	2,569,630.00
Queensland University of Technology						
DE210100205 Flannery, Dr David T	Australia continues to play a world-leading role in researching planetary habitability. This project will deliver the most comprehensive investigation of Earth's oldest known river/lake deposits, uniquely preserved in 2.8 billion-year-old rocks in Western Australia. Using the candidate's expertise in field investigation in combination with a cutting-edge analytical approach, the project will produce a detailed reconstruction of the ancient lake environment. Similar settings will be explored by NASA's upcoming Mars 2020 rover mission at it's landing site in Jezero Crater. Mission data will be analysed by the candidate, who will guide the selection of samples and address the overarching question of whether microbal life ever existed on Mars.	61,000.00	124,000.00	122,500.00	59,500.00	367,000.00
	National Interest Test Statement This project will develop improved rock chemistry sensors and innovative software for rapid geochemical data analysis and for enhanced spacecraft autonomy. Better, faster and less costly rock chemistry sensors and software for processing vast geochemical datasets will enable new ore exploration strategies, including under regolith cover. This will increase mineral discovery in Australia and improve the efficiency of Australian and Australian-owned minerals processing industries. The project will also build Australian capabilities in the operation of complex spacecraft with benefits to defence and remote terrestrial and extraterrestrial resource exploration and extraction industries. The science investigation of the Perseverance Rover will provide an exciting multidisciplinary environment for training the next generation of researchers, who will lead the investigations driving the most ambitious deep space missions of our international partners.					

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DE210100525 Pappalardo, Dr Kylie	This project examines the impact of copyright law in Australia's screen industries, focusing on distribution and access to audiovisual material. It seeks to understand how copyright law and practice can better ensure that the wealth of humankind's recorded creative output is available for people to enjoy, learn from, and reuse. It combines novel digital research methods with in-depth interviews to study the challenges of licensing and distribution in the screen industries, where copyright is at its most complex. It aims to provide rigorous evidence to inform the development of technology-neutral regulation for Australia's copyright industries, improve copyright licensing markets, and unlock the value of under-distributed screen content.	72,554.50	139,530.50	138,258.00	71,282.00	421,625.00
	National Interest Test Statement This project seeks to increase the distribution of knowledge and cultural goods in Australia, by improving copyright regulation and practice. It focuses particularly on Australian screen content, including Australian drama, sports, Indigenous stories, historical material, children's content, and niche and culturally diverse content. The project will generate the evidence that is urgently needed to help reform Australia's media laws in the transition to digital distribution. It is designed to inform ongoing attempts to create technology-neutral regulation, helping to make copyright law fit for purpose in the digital environment. Practically, this project develops best practices guidelines to help Australian filmmakers, TV producers, archivists, documentarians and broadcasters to navigate the thicket of copyright permissions that surround the production and management of film and TV content. This will also help Australia reclaim economic and cultural value from large volumes of existing and archived audiovisual content that are not currently accessible.					
DE210100735 O'Brien, Dr Erin G	To combat the grave problem of modern slavery in supply chains, governments rely on consumers and investors to hold corporations accountable. Yet little is known about the critical role civil society plays in empowering citizens to serve this function. In this world-first study of an anti-slavery advocacy network, this project aims to investigate how civil society can mobilise ethical consumerism to combat slavery. This project expects to generate new knowledge on how civil society can work with the state to address complex issues with ethical consumerism. Expected outcomes include the integration of successful strategies into policy and advocacy, to provide significant benefits in building Australia's capacity to eradicate modern slavery.	67,516.50	136,340.00	135,514.00	66,690.50	406,061.00
	National Interest Test Statement This project aims to support Australia's efforts to meet the United Nations' Sustainable Development Goal 8.7 for the eradication of modern slavery. By providing a robust evidence-base to directly inform Australian policy and advocacy, this project builds Australia's capacity to prevent modern slavery in supply chains through engaging ethical consumers and investors, and incentivising corporate social responsibility. Expected immediate benefits include: (i) the identification of innovative tools to mobilise ethical consumerism, for integration into anti-slavery advocacy programs; (ii) the identification of successes and governance gaps in current approaches, to aid in implementation and review of the Modern Slavery Act 2018, and the National Action Plan to Combat Modern Slavery; and (iii) the establishment of best practice for civil society working in concert with the government to address complex issues. With stakeholder engagement, and research disseminated through quality publications, policy briefings, media and symposia, this project will underpin future policy and advocacy to eradicate modern slavery.					
DE210101385 Guerrero Gonzalez, Dr Angela M	Adoption of agricultural practices to reduce the impacts of land-based run-off on water quality is necessary to ensure that ecosystems that deliver substantial economic and social benefits, such as the Great Barrier Reef, are preserved. But up-take is currently limited by lack of behaviour change. Using novel network modelling and mixed methods, this interdisciplinary project will measure the importance of international trade and peer influence on the adoption of sustainable practices. Outcomes are expected to drive cost-effective stakeholder engagement solutions that will increase uptake of sustainable practices. At stake are natural ecosystems whose health is critical for delivering economic value, and social and ecological benefits.	65,506.50	135,667.00	143,476.50	73,316.00	417,966.00
	National Interest Test Statement The outcomes of this research will enhance the economic, social, and environmental benefits delivered by the tourism and fishing industries in the Great Barrier Reef (GBR), which contributes $6.4 billion annually to Australia's economy. The knowledge generated by this research will lead to the development of cost-effective stakeholder engagement programs that harness the most important sources of social influence driving farming decisions. Expected benefits will be an increased uptake of sustainable agricultural practices to meet water quality targets in the GBR. Ultimately, this project will lead to increased capacity of actors at state and national levels to manage the impacts on water quality from agricultural activities in the GBR catchments, thereby increasing the future viability of the economic, social, and environmental benefits delivered by the GBR.					

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DE210101782 Alford, Dr Jennifer H	This project investigates how migrant and refugee-background youth learn to read critically in school, and in everyday, out-of-school contexts. Youth engage in the complex online worlds of websites, Apps, digital gaming and other media, posing both opportunities and risks. Their challenge is navigating learning to read English, and to read critically in English. Using qualitative methods, this study will identify the critical reading practices of these youth, and create resources to enhance their critical reading skills out-of-school. Drawing connections between in and out of school reading benefits migrant and refugee-background youth and teachers to strategically manage critical reading in complex, contemporary reading environments.	61,065.50	115,618.50	110,672.00	56,119.00	343,475.00
	National Interest Test Statement The project expects to provide migrant and refugee-background youth with crucial practices to enhance their critical reading and viewing out of school. It will also yield significant benefits for teachers in the form of deeper understandings of how these learners approach reading, especially reading online material, out of school. It will produce scholarly publications, media summaries of the project, and instructional resources for schools. These will buttress educational services for migrant and refugee-background students and promote better education outcomes. The project will potentially lower public costs on educational failure, increase social cohesion and intercultural understanding, and provide policy and curriculum implications in and beyond Australia.					
DE210101864 McFadyen, Dr Aaron D	This project aims to accurately quantify the mid-air collision risk associated with low-altitude unmanned operations in urban airspace through the creation of new data-driven collision risk modelling techniques. Without such techniques, drone operations remain suppressed so their true potential cannot be realised. The collision risk models address this by providing the key missing knowledge that can underpin/enable vital unmanned traffic management applications, including airspace design and the development of separation standards. This can ultimately enable greater access to urban airspace without compromising air safety such that we unlock the commercial and societal benefits of drone use and help modernise urban air transportation.	73,250.00	147,250.00	148,000.00	74,000.00	442,500.00
	National Interest Test Statement Air transportation systems have the potential to be revolutionized worldwide by drone (unmanned aircraft) technologies that could bring huge commercial (trillion dollar value), economic and social (improved security, emergency services etc.) benefits. To unlock these benefits, drones require regular and safe access to low-altitude urban airspace which is currently restricted due to mid-air collision risk concerns. New collision risk modelling techniques backed by real data are crucial to enhancing our understanding of the collision risk associated with drone operations and provide the key enabling capability to unlock our airspace and underpin new automated unmanned traffic management services. This research will derive such models and deploy them for applications such as low-level airspace design and separation standard development to modernize air transport in our cities and help shape the future urban airspace.					
	Queensland University of Technology	400,893.00	798,406.00	798,420.50	400,907.50	2,398,627.00

The University of Queensland

DE210100005 Redshaw, Dr Jonathan P	Modern humans routinely use external thinking tools (e.g., calculators, GPS, smartphones) to solve problems that we once solved internally: a behaviour termed cognitive offloading. This developmental psychology project aims to chart the processes underlying children's use of such tools, and to uncover the associated benefits and harms. Using innovative methods specifically designed for children, the project expects to greatly advance scientific understanding of one of the most powerful facets of human behaviour. Expected outcomes include knowledge of critical factors that promote and impede efficient use of thinking tools. This knowledge will provide significant benefits, such as an enhanced capacity to train children to be more proficient.	75,456.50	148,490.00	150,081.00	77,047.50	451,075.00

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	National Interest Test Statement The ability to incorporate external tools into cognitive problem solving is becoming increasingly central to modern notions of intelligence. Australian children now routinely use digital devices to assist with academic tasks, and they often also rely on more traditional thinking tools such as pencil-and-paper and maps. This project will determine, for the first time: (1) at what age children initially become capable of using novel external thinking tools, (2) whether children choose to use thinking tools even when their internal abilities are sufficient, (3) whether children are more likely to use thinking tools in high stakes than low stakes situations, (4) how children's use of thinking tools is influenced by confidence in their own internal abilities, and (5) whether over-use of thinking tools can harm children's internal aptitude. The project promises to enhance our capacity to train Australian children to be more proficient in their use of thinking tools, thereby fostering long-term social and economic benefits in a society that increasingly depends on outsourcing of mental work.					
DE210100160 Hua, Dr Wen	Information extraction which identifies entities and relations from data is a key technology that lays the foundation for understanding the semantics of data. This project aims to investigate the problem of information extraction by innovatively exploring the informality and temporal evolution of data. It expects to develop novel techniques for reliable, efficient, and scalable information discovery from large-scale low-quality data. Expected outcomes include a set of collective, contextualised, and temporal-aware algorithms for information extraction and integration, built on top of effective indexing and in-parallel processing. This project is anticipated to benefit a considerable number of data-driven intelligence-based applications.	70,500.00	141,000.00	141,000.00	70,500.00	423,000.00
	National Interest Test Statement Big datasets, particularly those collected from informal mediums like online forums, reviews, social media or search queries, are often inaccurate, incomplete and inconsistent. Extracting reliable information from these noisy datasets is an issue both for Australian researchers and for industry. Current solutions are not sufficiently effective or easily scalable. This project will develop a publicly accessible prototype system capable of extracting reliable information efficiently from big noisy datasets. Given the increasing reliance on information-driven and intelligence-based applications, this study will bring economic, commercial and social benefits to Australia by improving performance of services such as personalised recommendation, event monitoring, transportation management, and response to natural disasters. In particular, the developed techniques could provide greater surety in the accuracy of the discovered knowledge, improving decision-support and service delivery nationally in sectors such as finance, business, emergency response and transport, with smarter prediction, tracking and planning.					
DE210100422 Deuis, Dr Jennifer R	The project aims to investigate how sodium channel subtypes contribute to the excitability of sensory neurons by utilising venom-derived peptides that specifically target and alter the function of these channels. This project expects to generate new knowledge in the area of neuroscience using an interdisciplinary approach including synthetic peptide chemistry, pharmacology and electrophysiology. Expected outcomes of this project include the development of new venom-based research tools and improved techniques for studying sodium channel function. This will provide significant benefits, including advancement of fundamental knowledge in physiology and the development of novel analgesics.	75,761.00	151,955.00	147,912.00	71,718.00	447,346.00
	National Interest Test Statement Animals such as scorpions, spiders and cone snails secrete toxic venoms for protection against predators or for immobilising their prey. These venoms have extremely potent biological actions due to the presence of cocktails of peptides, highly evolved over millions of years to selectively interact with ion channels. This research will utilise this diversity to develop new research tools with commercialisation opportunities, enhance ion channel research and improve our understanding of neuronal function, which will overall contribute to the sustainability of Australia’s biotechnology sector. Thus, the research contributes to Australia's national interest through its potential economic benefits resulting from translating this research to commercial outcomes and the training of the next generation of researchers.					
DE210100582 Lam, Dr Jack	This project aims to investigate whether and how significant life events generate temporary or sustained changes in loneliness, using rich panel survey data and the collection of in-depth interviews. This project expects to generate new knowledge on dynamics of later-life loneliness using an innovative multi-level, mixed-methods approach examining household and community characteristics that may also shape changes in loneliness. Expected outcomes includes documenting and explaining how life events generate variations in loneliness, identifying new directions for understanding this pressing topic. Findings are expected to provide significant benefits, including improved economic and social outcomes for individuals, families, and Governments.	75,326.00	146,839.50	146,984.00	75,470.50	444,620.00

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	National Interest Test Statement Loneliness in older adults has been recognised as a significant social problem and carries large economic costs to Governments. This research will contribute to understanding loneliness from a longitudinal and life course perspective, providing evidence on whether the experiences of different life events may render older Australians more susceptible to a sustained path to increased loneliness and isolation. While life transitions and events may be experienced by individuals, the proposed project will innovate by moving the analysis beyond the individual level, incorporating characteristics across households and neighbourhoods. This will allow for assessing whether these contexts work to buffer or magnify fluctuations in loneliness. New knowledge from the project will help to address some of the practical challenges associated with population ageing. Findings from the project would be of benefit and interest to a range of aged care providers and government departments, as well as families, communities and individuals.					
DE210100790 Rideaux, Dr Reuben	The ease with which we perceive the external world belies the complexity involved in integrating different sensory inputs. How does the brain achieve this fundamental operation? The project will address this question using a multidisciplinary approach that combines computational modelling, brain imaging, and psychophysical techniques. The expected outcomes of the project are a better understanding of how people perceive the world through optimal integration of sensory cues. In addition to advancing basic scientific knowledge, the findings will illuminate perceptual anomalies in normally developing children and will provide a foundation for reducing a debilitating side effect of virtual reality systems known as ‘cybersickness’.	70,288.00	139,971.00	139,366.00	69,683.00	419,308.00
	National Interest Test Statement This project will benefit neuroscience in Australia by testing a biological model of sensory integration that explains how different sensory inputs are integrated in the brain to support perception. It will combine advanced computational modelling, brain imaging, and psychophysical techniques to understand the neural implementation of sensory integration. The findings will illuminate the operations that shape the development of perceptual processes in children, and could help inform optimal strategies for education and environmental design. Knowledge gained through the project will benefit the rapidly growing use of virtual reality (VR) systems in industry and training, by identifying the underlying causes of ‘cybersickness’, a common side-effect of VR from conflicting sensory cues. Beyond the scope of the project, the findings from this research also have the potential to impact future efforts to understand abnormal cue integration processes in people who experience sensory delusions and hallucinations.					
DE210100848 Harris, Dr Glen I	This project aims to build the first photonic architecture capable of controlling the quantum properties of acoustic waves travelling in crystalline materials and quantum fluids. This level of control is expected to herald new capabilities in sensing applications, quantum information and quantum computing. The project seeks to develop a silicon-based photonic platform that enables the preparation of non-classical states of sound within superfluid helium. This new platform will also be used to develop an ultra-compact silicon-chip based laser. The project outcomes should provide a deeper understanding of quantum fluids and quantum mechanics, and enable the realisation of new quantum technologies with substantial commercialisation potential.	73,981.00	144,460.50	144,668.50	74,189.00	437,299.00
	National Interest Test Statement This fellowship aims to develop novel on-chip photonic systems that explore light-sound interactions to advance knowledge in fundamental physics and develop next-generation technologies. The research outcomes of this DECRA are expected to facilitate the development of ultra-compact silicon-based lasers for telecommunications, ultra-precise gyroscopes for navigation, and quantum-coherent microwave-to-optical converters for quantum information processing. As such, this project has enormous potential to generate IP and patents in quantum technology, bringing economic and commercial benefits to Australia’s nascent quantum technologies industry. This project will also result in high-impact publications coupled with broad media coverage, providing cultural benefits to the scientific community and general public. Furthermore, it will train postgraduate students in advanced nanofabrication techniques, contributing to Australia’s advanced manufacturing workforce and fostering the growth of high-tech industries.					
DE210100854 Wu, Dr Chung-Chi	The aim is to use an advanced mechanistic crop model to investigate the interacting plant physiological processes that define yield consequences, using a sorghum model. This will involve unravelling the complex relationship between leaf gas exchange properties and crop field performance. Through a unique combination of model prediction and gene editing to target the photosynthetic pathway and stomata, the research is expected to gain a deep mechanistic understanding of the underpinning processes and drive the transfer of promising bioengineering targets into crops. The research is expected to discover new avenues for crop improvement, and significantly benefit crop breeding and food production capacity.	76,872.00	153,738.00	153,752.50	76,886.50	461,249.00

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	National Interest Test Statement The DECRA will position Australia at the forefront of innovations in crop improvement. The project will significantly advance mechanistic modelling technologies for disentangling the complex interactions between biological processes that underpin crop-yield performance in production environments, and deliver novel gene editing methods for targeted enhancement. Combining novel modelling and gene editing approaches, the new mechanistic-driven bioengineering approach will greatly increase the probability of boosting yields of Australian's most important summer crop sorghum. The research will discover new avenues to achieve yield improvement and accelerate development of yield-advancing crop varieties. Through the innovations and strong industry collaborations, the advances will enhance the efficiency of Australian sorghum breeding; this will generate substantial positive impacts for the nation's agriculture sector and economic future, and contribute to safeguarding global food security. The outcomes will open new research opportunities to improve the productivity of other crops.					
DE210100930 Wang, Dr Zhiliang	The project aims to achieve efficient renewable hydrogen production through solar driven photoelectrochemical water splitting. As a carbon-emission free process, photoelectrochemical water splitting is significant in solar hydrogen supply. The key idea is to design innovative photoelectrode materials using defect engineering strategy which allows more efficient conversion of solar energy to hydrogen. The expected outcomes include high Solar-to-Hydrogen conversion efficiency on the new materials and cutting-edge knowledge in advanced material design. The success of this project will contribute to the implementation of the Australia's National Hydrogen Strategy and position the nation at the frontier of renewable hydrogen supply technologies.	66,158.00	132,316.00	132,316.00	66,158.00	396,948.00
	National Interest Test Statement This project closely aligns with the Australia's National Hydrogen Strategy which aims to make Australia a global hydrogen industry player by 2030. The project should pave a promising way towards the aim by the development of unbiased photoelectrochemical water splitting system for efficient hydrogen production without consuming external electricity. The hydrogen production process is a carbon-free process that can minimise the environmental burden to Australia. Moreover, since this is an unbiased process, totally driven by solar without consuming electricity, it should help to save a vast amount of energy for hydrogen production. The success of this project will convert Australia's abundant solar energy into valuable hydrogen. It should position Australia at the front of the increasing global momentum for clean hydrogen production, and bring potential economic benefit and jobs in Australia. The project will also provide professional training to the students which should greatly expand Australia's knowledge and the research and development capability in functional materials for clean hydrogen production.					
DE210100934 Mounaix, Dr Mickael M	This project aims to develop two prototype optical beam shaping systems, culminating in the demonstration of new high-power optical fibre amplifiers. This novel ability to control all the properties of light enables the generation of optical beams that were only theoretical ideas but never previously implemented experimentally. This advanced technology can potentially open new ways in which objects can be probed using light. Expected outcomes include the creation of an optical platform that the optical community at large may utilise for their specific applications. Besides the intellectual property benefits of such optical devices directly, this project should bridge the gap between the developed knowledge and commercial opportunities.	72,584.50	146,036.50	146,956.50	73,504.50	439,082.00
	National Interest Test Statement Probing the interactions between light and matter is a powerful tool for the physical understanding of our environment. Over the course of this project, two prototype of optical beam shaping systems will be developed to generate new light beams. Such beams could probe matter in unprecedented approaches, which should benefit the scientific communities at large. Beyond its academic relevance, this project should foster the Australian economy and industry through its promising commercial interest. Indeed, this project aligns with the Australia National Science and Research Priority of Advanced Manufacturing. The prototype devices could be integrated on existing industrial applications within Australia that require accurate light control, such as optical signals for networking and optical machining. This project could also trigger entrepreneurial activities, thanks to the wide applicability of such beam shaping technology. Hence this project would contribute to foregrounding Australia in the global photonics market, which according to the Society for Optics and Photonics, was worth USD 282 billion in 2018.					
DE210100973 Chapman, Dr Susannah	This project aims to examine the development of a system of end point royalties for patent and plant variety-protected crop varieties in Australia, wherein royalties are calculated on the harvest. In tracking shifts in the royalty system, the project will provide insight into how emerging modes of plant regulation shape the social, economic, and legal relations of Australian grain and fruit production. Expected outcomes of the project include enhanced understanding of the opportunities and challenges that have arisen in the adoption of new royalty arrangements. This should provide significant benefits, such as more equitable management of intellectual property and the identification of social arrangements that can improve food production.	74,500.00	145,000.00	142,000.00	71,500.00	433,000.00

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	National Interest Test Statement This project aims to benefit Australia in a number of ways. First, the research has the the potential to be of economic and commercial benefit by enhancing knowledge about the operation and transformation of agricultural supply chains under new regulatory practices. Findings from the project may help identify novel market innovations, technological applications, or social arrangements that will improve food production through enhanced traceability, better quality control, and more equitable accessibility to important agricultural resources. Second, the research has the potential to be of social benefit by providing insight into different people's experiences with end point royalty arrangements, knowledge that could help improve relations between intellectual property owners, farmers, and other end-users. Third, the project has the potential to be of cultural benefit by enhancing understanding of the changing parameters of seed regulation and human-plant relations within Australian agriculture.					
DE210100994 Hogan, Dr Anna R	Philanthropic involvement in schooling is prevalent, yet there is no academic research that investigates the substantive consequences of this development in Australian public schooling. The aim of this project is to develop new knowledge in education sociology of how philanthropy is influencing practices of school governance and contributing to systemic inequity within the public school system. The project seeks to build the capacity of education stakeholders to critically evaluate public school privatisation. Further, it hopes to inform sociological theories of what post-Welfare democracies are, and what the state's role ought to be in the public provision of schooling, particularly in relation to equitable school funding arrangements.	66,072.50	140,973.50	147,868.50	72,967.50	427,882.00
	National Interest Test Statement There is ongoing concern in Australia regarding the funding arrangements of schools, with federal government inquiries suggesting current policy arrangements are complex and that many public schools are underfunded on the basis of need. Research evidence suggests public schools feel increasing responsibility to raise sources of private income to support their day-to-day practices. To date, we have no understanding of the consequences of this philanthropy, particularly in terms of how it is mediated by school demographics, and how it is influenced by school administrative practices. It is in Australia's national interest to understand whether systemic inequity is likely to increase under current school funding arrangements. This information will help education stakeholders critically evaluate increasing privatisation, and the role of private income and private actors in Australia's public school system. This project will help define the value of a robust public school system for the future of Australian society.					
DE210101026 Roberts, Dr Benjamin M	The Standard Model is extremely effective at describing the fundamental particles and interactions, but is known to be incomplete. This project aims to uncover new signatures of physics beyond the Standard Model that may be observed in atomic experiments. This project expects to generate new knowledge to help unravel the mystery of dark matter, which accounts for the majority (85%) of the matter in the universe. Expected outcomes include extending theoretical atomic physics methods, calculating new observable atomic effects, and combining these with experiments to probe fundamental physics and search for dark matter. These outcomes would contribute to the expanding knowledge in the fields of atomic and fundamental physics.	74,022.50	146,685.00	145,395.00	72,732.50	438,835.00
	National Interest Test Statement The proposed project explores some of the most important problems facing atomic and fundamental physics today, including the nature of dark matter. Visits from international experts to Australia will be facilitated, strengthening collaborative ties and furthering Australia's standing in these fields. Development of new methods for calculating atomic structure would provide economic and commercial benefits to Australia through their use in the optimisation of instruments such as atomic clocks (used for precise positioning and navigation), which rely on high-accuracy atomic calculations. This research would also build Australia's capacity in quantum science, crucial for the development of emerging technologies, such as quantum electronic devices and quantum computing. The project would have a large computational component, expanding Australia's expertise in software, high-performance computing, and numerical methods. The research is of broad cultural interest, and project outreach will provide social and economic benefits by increasing community participation and engagement in STEM.					
DE210101072 James, Dr Christopher J	This project aims to investigate how flow radiation and heat shield ablation products interact under the fastest hypersonic Earth entry conditions ever considered – Mars return. To survive the harsh conditions experienced during planetary entry, spacecraft rely on ablative heat shields burning away through processes which are still not fully understood. Using UQ's unique X2 hypersonic wind tunnel to generate realistic flight conditions, the expected outcome of this project is an enhanced understanding of the complex ablation radiation coupling physics experienced during Mars return. This will bring humankind closer to travelling to and from Mars and increase our knowledge of these entries and the specialist materials needed to survive them.	71,978.50	144,094.00	143,882.50	71,767.00	431,722.00

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	National Interest Test Statement This project strongly aligns with the Australian Space Agency's goal for Australia to be involved with NASA missions to the moon and Mars by working directly with NASA researchers working on these missions. It will use UQ's unique experimental capabilities to increase understanding of the specialist, high performance ablating materials which protect these vehicles by burning away during Earth re-entry and how their burning properties affect the re-entry environment which they encounter. This is a critical contribution to the knowledge needed to return people from Mars, which will enable the design of safer and lighter space vehicles in the future. It will establish Australia as a leader in the testing of these materials and entries. These specialist materials are required for most planetary entry scenarios, meaning that knowledge about them is critical to support the development of local Earth re-entry capability in the future and to support the future Australian advanced manufacturing companies who will one day manufacture these materials in Australia.					
DE210101089 Mukandi, Dr Bryan T	This project aims to provide a deep understanding of the manner in which Black (Aboriginal and Torres Strait Islander, African and Afro-diasporic) people understand their children's situation. While dominant conceptions of childhood are typically assumed to be universal, they generally take the figure of the white child, emerging out of a predominantly European body of knowledge, as paradigmatic. This project seeks to expand, reconfigure and present a more complex understanding of childhood, one which more adequately reflects Australia today. It is thereby expected to contribute to the work of ensuring that as befits a just, plural society, those whose roles relate to children have an inclusive rather than a parochial grasp of childhood.	76,100.50	151,455.00	144,486.00	69,131.50	441,173.00
	National Interest Test Statement Childhood is a fundamental category, one in which every Australian community is deeply invested. Uneven social outcomes that are race-based, for example disproportional rates of Indigenous youth incarceration or claims of widespread gang culture among African youth, raise troubling questions about potential unequal treatment and mainstream perceptions of children from those communities. This project is of social and cultural benefit to Australia by way of its potential contribution to shared understanding and enhanced intercultural dialogue. The academic work of facilitating more informed and more just perception and understanding may contribute to a different approach towards Black children on the part of service providers in the criminal justice system, education, social services, health and so forth. Such work, by expanding the dominant understanding of experiences of childhood, may also inform the policy process. This project therefore contributes to the National Interest by making it more likely that noble intentions, at the level of policy or service provision, are not thwarted by misunderstanding.					
DE210101144 Guillerey, Dr Camille S	This project aims to investigate the interactions between two populations of immune cells: natural killer cells and dendritic cells. This proposal will advance basic knowledge in immunology by innovating in considering the heterogeneity and diversity of these two immune populations and combining interdisciplinary approaches using cutting-edge technologies. Expected outcomes from this proposal include the identification of new immunoregulatory pathways, the development of new scientific theories, and enhancement of Australia's research capacity through international collaborations and student training. This project will provide significant benefits such as the identification of biological targets for development of new biotechnologies.	74,500.00	145,075.00	140,225.00	69,650.00	429,450.00
	National Interest Test Statement This project will address fundamental questions in Biological Sciences by investigating cellular interactions regulating immune responses. This proposal will improve human knowledge, thereby consolidating Australia's world leadership in scientific research and benefiting Australia's culture. Findings arising from this proposal will contribute to a better understanding of mechanisms underlying immune homeostasis. Given that the maintenance of a well-regulated immune system is essential for an individual's participation in the community, particularly in relation to family and employment, this project will have important economic and social impacts on the Australian society. Finally, by identifying new pathways regulating immune responses in healthy individuals, this project will pave the way to the development of biotechnologies (e.g. biomarkers, vaccines, cellular products) that will benefit many Australian industries with positive economic and commercial outcomes for the Australian society.					
DE210101297 Sun, Dr Hongfu	This project aims to develop a novel quantitative imaging technique for comprehensive in vitro and in vivo tissue characterisation on the microscopic scale. The technology innovated in the project could revolutionise microscopic imaging techniques by breaking through the sub-millimetre image resolution bottleneck of current magnetic resonance imaging (MRI) methods. This project expects to generate new knowledge in the emerging field of biological imaging and to deliver an integrated imaging platform for mapping various tissue microscopic components at the cellular level. Successful outcomes have the potential for commercialisation and will accelerate a range of fundamental science and engineering studies requiring imaging techniques.	71,500.00	143,000.00	143,000.00	71,500.00	429,000.00

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	National Interest Test Statement Quantitative tissue microscopic characterisation is a prerequisite for many fundamental science studies. Conventional magnetic resonance imaging (MRI) methods are commonly used for in vitro and in vivo imaging non-invasively but can only achieve a spatial resolution on the sub-millimetre scale. This project aims to innovate an advanced MRI technique, which will enable quantitative imaging at the microscopic cellular level. Successful outcomes will lead to more than 400% MRI scan time reduction, which could revolutionise the current imaging practice in Australia and save a tremendous amount of money for various research studies requiring tissue imaging. This project will also expand knowledge in signal and image processing technology as well as computer science and artificial intelligence, which may benefit a broader range of applications beyond life sciences. Finally, the high-quality research environment will contribute to the field of imaging research in Australia and promote national and international collaborations.					
DE210101407 Voss-Fels, Dr Kai P	This project aims to investigate how well multi-dimensional biological and environmental data can be integrated to improve the prediction of plant performance under climatic fluctuations. This project expects to generate new knowledge in the area of quantitative genetics using an approach that combines trans-disciplinary research fields. Expected outcomes of this project include an example for how to advance conventional prediction methods using fundamental biological models that underlie plant growth. This will provide significant benefits, such as an enhancement of collaborative research across areas with the potential to significantly advance the general understanding of how plants interact with the environment.	71,606.00	146,927.00	152,156.00	76,835.00	447,524.00
	National Interest Test Statement The rate of genetic improvement in crops must be doubled to secure future food supply. This project, if successful, will develop new quantitative genetics approaches that could help to boost the rate of genetic gain under strong environmental fluctuations. The approach will be developed and validated for crops but it has a broader implications for all disciplines that are grounded in quantitative genetics theory, such as human or animal genetics. This will contribute to food source security with broader, wide-reaching sustainability benefits for the public and private agricultural sector. By following a novel trans-disciplinary approach that integrates a range of research disciplines that have never been combined in crop genetic improvement, such as fundamental hormone biology, environmental science and Artificial Intelligence computing, the outcomes of this project will have direct impacts on shaping future strategies for the development of climate-ready crops. This will have long-term benefits for Australian crop research and industry, with the potential to develop international partnerships in the future.					
DE210101439 Clark, Dr Nicholas J	This project aims to develop a quantitative framework for multivariate ecological prediction. This will allow us to better anticipate how ecosystems respond to environmental change. Recent modelling advances now make it possible to use the complexity of community ecology data to deliver better predictions. The project intends to use long-term ecological datasets to build and test novel multivariate prediction models, using tick paralysis rates in Australian dogs as a case study. Expected outcomes are better tools for studying ecosystem change and new hypotheses about how ecological communities are shaped. Application of these models should provide significant benefits, such as prediction of paralysis tick burdens to improve risk mitigation.	71,902.50	147,203.50	150,602.00	75,301.00	445,009.00
	National Interest Test Statement Environmental changes, whether climate change, resource depletion or habitat modification, pose unprecedented threats to Australia’s ecological communities. These threats have far-reaching societal impacts. For example, rates of tick paralysis in Australian dogs represent ecological responses by ticks to changing environments. This project aims to build better community ecology models and to outline a quantitative framework for analysing their results so that we can continually improve our knowledge of how ecosystems respond to environmental impacts. These innovative ecological models will enhance capacity to anticipate change, which is essential for guiding evidence-based environmental policy. This research can be integrated into actionable strategies to benefit Australia across numerous sectors including tourism (biodiversity and conservation management), biosecurity (decision support for parasite and crop pest management) and agriculture (understanding ecological responses to drought and bushfire). This project therefore has direct relevance to Australia’s economic, environmental and social interests.					
DE210101440 Luskin, Dr Matthew S	This project aims to develop a suite of innovative analysis techniques to study wildlife communities with remarkable resolution. This project expects to generate new knowledge in the fields of ecology and conservation biology by leveraging the unprecedented quantity and quality of data captured through a large network of camera traps in Australian and Southeast Asian forests. Expected outcomes include developing novel approaches to analysing wildlife data (meta-structural equation modelling) and delivering management guidance to Australian land-owning agencies that may vastly cut costs by identifying efficient interventions and improve conservation outcomes.	69,302.50	141,442.50	146,205.00	74,065.00	431,015.00

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	National Interest Test Statement Australia is globally renowned for its unique rainforests, but these now occupy 1% the land area. A pressing issue is the decline of wildlife inside fragmented forests. However, ostensibly similar forest patches (parks) can experience diverse wildlife outcomes ranging from defaunated or overrun with invasive species, yet the factors underlying this variation remain largely unknown. Crucially, multiple pressures routinely precipitate rapid losses in native mammals. If we are going to prevent extinctions, we need to assess the combined effects of multiple pressures on species and food-webs. This project leverages troves of underutilised wildlife survey data using innovative analysis techniques to understand how threats interact to shape wildlife outcomes. It will deliver clear management guidance and cost-savings to Australian agencies by identifying efficient interventions for improved conservation outcomes. Side-benefits include increased employment and training of scientists and fieldwork will be conducted in rural areas of Queensland, thereby returning most the funds into the Australian economy.					
DE210101639 Pope, Dr Benjamin	We now know that nearly all stars host planets, and exoplanet science is now turning to bright individual systems. This Project aims to study the nearest, brightest stars by extending the capabilities of NASA's TESS telescope and Mount Kent Observatory. This is significant as the best chance we have to detect planets around stars bright enough to measure the planetary and stellar properties precisely. The expected outcomes of this project will be the discovery of planets transiting nearby naked-eye stars, and crucial measurements of the masses of these stars and planets. The benefits of this will be a key sample of new, well-understood benchmark systems, and new open-source algorithms for data analysis in astronomy and more broadly.	73,312.50	147,725.00	148,725.00	74,312.50	444,075.00
	National Interest Test Statement The proposed research reveals new knowledge of stars and planets that has previously been unattainable, cementing Australia’s position as a world-leader in the rapidly-growing field of exoplanet science. Recent international and ARC investment in new Australian telescopes will be leveraged to enable collaborations with the NASA Transiting Exoplanet Survey Satellite mission. The project will focus on stars significant to Western, Asian, and Indigenous cultures. Communication of these discoveries will deepen Australian public understanding of its society, history and cultures. New transferable machine learning technology for satellite data analysis will result in economic benefits to Australia’s growing space and data science industries and build new workforce capabilities through student training opportunities.					
DE210101666 Song, Dr Hao	This project aims to develop a next-generation adhesive nanoparticle platform through in-depth understandings of nanoparticle interactions with bio-interfaces. This project expects to generate new knowledge in the multidisciplinary research field at nano-bio-interfaces by using a recently developed nano-colloidal probe technology, instructing the rational design of nanoparticles with enhanced interface adhesive properties. Expected outcomes include a family of adhesive nanoparticles designed for nanopesticide and animal feed applications, with the potential to deliver valuable intellectual property of commercial interest and economic benefit through technology advancement.	66,478.00	132,136.00	131,316.00	65,658.00	395,588.00
	National Interest Test Statement This project will develop a family of new nanomaterials with enhanced adhesion at the nano-bio interfaces, provide an in-depth understanding of the nanoparticle-interface adhesion behaviour. This interdisciplinary research will benefit Australia by advancing knowledge in the emerging area of nano-bio-interface, as well as generating an adhesive nanoparticle platform with the potential to be used in agricultural applications to deliver economic benefits. The nano-colloidal probe technology used in this project can be applied to other research fields using nanoparticles to gain a unique mechanical perspective. The expected outcomes will likely be translated into new pesticide and animal feed technologies using engineered nanoparticles with strong adhesive properties. In doing so, the project will help position Australia at the forefront of the $64 billion agriculture market.					
	The University of Queensland	1,518,202.50	3,036,523.00	3,038,897.50	1,520,577.00	9,114,200.00
University of Southern Queensland						
DE210100852 Dinh, Dr Toan K	Based on my recent discovery on giant thermo-/piezo-resistance, this project aims to enhance fundamental understanding and enable the development of high performance silicon carbide based sensors. The project employs these knowledge advancements to develop new sensors with a sensitivity of thousand-fold larger than that of conventional sensors. The project develops multiple sensors and light harvesting cells to be integrated into a monolithic platform that can function in corrosive environments. The sensor technology can be utilised for monitoring structural health, reducing failure and extending lifetime of structures, providing cutting-edge knowledge to petrochemical and mining industries which are of particular importance to Australia.	73,362.50	146,225.00	146,975.00	74,112.50	440,675.00

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	National Interest Test Statement This project supports the development of high value and innovative manufacturing industries in Australia, which strategically aligns with Australia's Strategic Science and Research Priorities of Advanced Manufacturing and Energy and Resources. The implementation of the proposed sensor technology can prevent failure by early detection of mechanical decay, which further increases employee safety and saves on maintenance costs in the resource industry. The new battery-free sensor technology reduces chemical related toxic waste, further promoting technologies that are clean to environments. The project will add more commercialization opportunity from existing national and international investment, which directly brings benefit to Australian resource industries. The knowledge and scientific innovations of this project expand Australia's research competence in fundamental physics and material chemistry, as well as advanced manufacturing.					
DE210101893 Zhou, Dr Yanjun	The majority of planetary systems around other stars are not like our Solar System. We now know that the most common types of exoplanets are super-Earths and Neptunes, planets with sizes ranging from Earth to Neptune, residing close to their parent stars. This project aims to characterise these planets at various stages of their evolution. This project will utilise Australian facilities to characterise new planets from the TESS space telescope, and is expected to probe the dynamical and physical properties of super-Earths and Neptunes as a function of age. Important benefits from this project include directly answering the origins of this dominant class of planets, and developing the techniques for the next decade of exoplanetary research.	70,962.50	141,853.50	141,782.00	70,891.00	425,489.00
	National Interest Test Statement Our understanding of planetary systems including our own is being transformed by space telescope observations. These observations however are critically dependent on the proposed ground-based follow-up studies to discover and characterise new worlds orbiting stars other than the Sun. This project positions Australia as a global leader in the hunt for planets from NASA's Transiting Exoplanet Survey Satellite mission and delivers key techniques for characterising the environments and atmospheres of Earth-like worlds. The project thus benefits Australia's standing in international research, will enthuse and be readily appreciated by a large Australian and international community, and provide the basis for the real and important benefit of engagement using a citizen science approach. This engagement in planet hunting will use space telescope data and Australian astronomical facilities and provide a pathway for Australia's next generation into Science, Technology, Engineering and Mathematics careers.					
	University of Southern Queensland	144,325.00	288,078.50	288,757.00	145,003.50	866,164.00
University of the Sunshine Coast						
DE210100367 Scales, Dr Kylie L	This project aims to advance global capacity to predict where and when incidental catch (bycatch) of protected non-target species (seabirds, marine turtles) occurs in longline fisheries, by harnessing the power of big data analytics. Using innovative interdisciplinary techniques, this project expects to generate new knowledge in marine ecology and fisheries oceanography. Expected outcomes include new institutional and disciplinary collaborations, advances in theory, and the development of novel digital tools for management authorities and industry. This should provide significant benefits, such as reduced costs to the fishing industry, risk reduction in decision-making, and progress towards international sustainable development goals.	71,000.00	139,500.00	139,500.00	71,000.00	421,000.00
	National Interest Test Statement Commercial fisheries provide a range of important economic, social and cultural benefits to Australia. Ecological sustainability in fisheries is essential to future profitability, and to addressing the marine biodiversity crisis currently occurring across the global ocean. This project will provide new knowledge and tools that will help address the ongoing problem of incidental catch (bycatch) of non-target species such as seabirds and marine turtles in longline fisheries that target tuna, swordfish and marlin. Marine turtles and seabirds such as albatrosses are legally protected by international agreements and domestic legislation, and so reducing incidental bycatch of these species is a priority for management authorities. Outcomes of this project will underscore Australia's position as a global leader in marine science, and contribute to Australia's efforts to meet its commitments under the United Nations Sustainable Development Goals, specifically SDG 14, "to conserve and sustainably use the oceans and marine resources for sustainable development"; and SDG 12, "responsible production and consumption".					
	University of the Sunshine Coast	71,000.00	139,500.00	139,500.00	71,000.00	421,000.00
	Queensland	2,851,147.50	5,684,068.00	5,661,206.50	2,828,286.00	17,024,708.00

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South Australia						
The University of Adelaide						
DE210100253 Duan, Dr Xiaoguang	This project aims to develop a family of structure-tailored, robust and metal-free carbon hybrids and environmental-benign processes for catalytic degradation of emerging microcontaminants in water. Innovations are expected in the design of reaction-oriented nanocarbons, new concept in atomic level carbocatalysis from computation and in-situ characterisation, advanced purification technology, and breakthroughs in material engineering. The anticipated outcomes will be the scientific basis for functional nanomaterials, nanotechnology, and green remediation technologies. Success will provide significant benefits in securing a sustainable future for Australia, with clean water and strategies for advanced manufacturing in related areas.	76,658.00	151,816.00	148,816.00	73,658.00	450,948.00
	National Interest Test Statement The project will address the severe, chronic pollution of emerging microscopic organic contaminants in Australia's soil and its freshwater and salt-water systems. The novel remediation system will be the basis of breakthroughs in the practical viability of functional nanomaterials for rapid decontamination of aquatic systems, using advanced and green nanotechnology. The outcomes will promote Australia's leading role in designing and developing engineered nanomaterials not only for environmental sustainability, but beyond it, with potential spinoffs in advanced manufacturing. The results will also have great significance for food and water security in a period of climate uncertainty that will require new approaches to maintaining or relocating some of our most lucrative agricultural production. A number of young scientists will receive interdisciplinary training that will position them for valuable roles in Australia's future workforce, whether in university or corporate research, development, agricultural consulting, or government.					
DE210100929 Armbrecht, Dr Linda	This project aims to utilise ancient DNA preserved in the seafloor to investigate how past Antarctic marine ecosystems have responded to past climatic changes, with a focus on the Holocene (last ~11,700 years). The study will generate the first-ever picture of marine community changes across the entire marine food web and unravel adaptation mechanisms of key marine organisms to climate shifts. Expected project outcomes will include significant knowledge advances into the evolution and resilience of Antarctic ecosystems over geological timescales. This will position Australia at the forefront of marine sedimentary ancient DNA research, and also provide valuable guidance for the conservation of Antarctica during ongoing climate change.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00
	National Interest Test Statement Ongoing climate change is unprecedented in its rate and effect, and research into Earth's resilience is a matter of urgency. One of the most vulnerable regions to climate change is Antarctica, where ice cap melting and warming ocean temperatures are starting to have catastrophic impacts, locally, on marine ecosystems, and globally, on sea-level rise. Australia has prioritised research into the associated environmental threats by calling for Special Antarctic Initiatives into Antarctic Science. This project aligns with this priority by investigating how key Antarctic sectors responded to past climate shifts, including ongoing global warming. This project will use a novel approach of extracting preserved ancient DNA from the seafloor, capitalising on material previously collected for this purpose during several Antarctic expeditions. The use of innovative ancient DNA techniques will enable food-web wide reconstructions, providing novel data for ecosystem models predicting climate change impacts on Antarctica, therefore Australia, and powerful insights into sustainability-related policymaking in Antarctica.					
DE210101773 Chen, Dr Yujie	This project aims to develop new generation coatings that combine highly controlled compositions and bio-inspired microstructural characteristics for safety-critical applications. This is made possible through smart materials design, multi-scale modelling and novel fabrication technique. The new coatings are expected to offer exceptionally high toughness underlain by a unique combination of various strengthening modes at multiple length scales. The application of the coatings will enhance the performance and safety of mechanical components in engineering applications, reduce associated costs. In doing so, this project will bring substantial benefits to advanced manufacturing, mining and aerospace sectors.	63,000.00	126,500.00	124,500.00	61,000.00	375,000.00

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	National Interest Test Statement Currently, industrial coatings used are principally ceramic-based compounds, which are susceptible to catastrophic failure and thus unsuitable for safety-critical applications. In this project, highly durable alloy coatings that combine highly controlled compositions and bio-inspired microstructural characteristics will be created to address this tough issue. Empowered by smart materials design, multi-scale modelling and novel fabrication technique, the new coatings allow for a unique combination of various strengthening modes at multiple length scales, thereby offering exceptionally high strength and toughness. The application of these coatings will deliver competitive advantages to a wide range of industrial sectors, where coatings are indispensable for improving the service life, performance and safety of critical components, and reducing associated costs. The new knowledge created in this project will also provide guidance in the quest of new generation alloys with excellent strength-ductility combination.					
DE210101904 Weng, Dr Wenle	This project aims to develop the science that would enable a new low-cost laser radar (LIDAR) for imaging the world around us. LIDAR has applications in facial recognition, forestry and autonomous vehicles – our new device will uniquely offer the ability to work underwater thereby opening up new possibilities for maritime environmental and vehicle monitoring. Our approach exploits a new form of optical pulse propagation in precisely shaped crystals to generate bespoke laser pulses that enable high-speed and precise ranging to targets of interest. The science behind these new types of optical pulses offers the ability for Australia to lead a new scientifically and industrially important field.	67,595.00	130,503.00	125,066.00	62,158.00	385,322.00
	National Interest Test Statement In 2005, the Nobel Prize was awarded for development of optical frequency combs: these have gone on to be revolutionary laser sources with uses in distance measurement, gas sensing, medical diagnosis, and telecommunications. Unfortunately, commercial optical frequency combs are large, delicate, and very expensive, which has limited their adoption in the wide range of fields that could otherwise benefit. This project will exploit the candidate's unique theoretical and experimental skills to develop a low-cost, compact and robust optical frequency comb that is suited to practical applications outside the laboratory. This stands to directly benefit Australian Science and Research Priorities such as Cybersecurity, Soil and Water, Environmental Change and Health through the comb's applications in high-speed optical telecommunication, hazardous gas detection and biomedical imaging. The project will specifically demonstrate an underwater laser radar, based on this new light source, that can contribute to the maritime operations and submarine program that are of priority to Australia national security.					
	The University of Adelaide	284,411.00	563,135.00	552,698.00	273,974.00	1,674,218.00
University of South Australia						
DE210100604 Boyle, Dr Sarah T	There is accumulating evidence that mechanical forces exerted on tissues and cells strongly influences their behaviour. My research aims to understand how cells sense and respond to forces experienced throughout life. Using a combination of three-dimensional cell and tissue culture methods, I will investigate how compressive forces change the biochemistry of cells and their functionality. This work is aimed at generating fundamental knowledge to improve our comprehension of how cells respond to force. The expected outcome is a greater understanding of mechanical and biochemical relationships between cells and the environment, to inform fields of tissue engineering of culture scaffolds to better mimic natural cell-tissue settings.	72,550.00	145,200.00	145,750.00	73,100.00	436,600.00
	National Interest Test Statement The outcomes of this research will contribute to Australia's national interest by enhancing our understanding of how mechanical forces, which are experienced at all stages of life, from embryonic development, to normal adult life and maintenance of cells and tissues, affect tissue function. This understanding has the potential to inform the fields of bioengineering, as many of our cell culture systems and models do not take into account how mechanical forces impact upon cell and tissue behaviour. This project may therefore produce new intellectual property with the potential for future commercial and economic benefits, and will help solidify the study of mechanical signalling as a research strength in Australia, educating new researchers and leading to collaborative job creation. While health outcomes are not an immediate focus of this project, my work has the potential to also benefit future research in health, by harnessing the knowledge of how cells respond to compressive force to investigate applications in chronic wound healing and cancer.					

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DE210101126 Morrissey, Dr Laura J	The project aims to improve Australia's ability to discover mineral deposits beneath sedimentary basins by determining whether detrital accessory minerals in sedimentary basins can be an effective exploration tool. This project expects to generate new knowledge on the stability of detrital accessory minerals in the sedimentary cycle using observations from natural rocks and laboratory experiments. Expected outcomes include an assessment of the accessory minerals that are best suited to exploration vectoring studies in sedimentary basins. This should provide significant benefits to government and industry by improving mineral exploration methods and also has implications for geochronology and provenance studies. **National Interest Test Statement** Mineral and energy resources are a significant contributor to Australia's economy. They will continue to be vital as the development of new and sustainable technologies requires increasingly large amounts of base, precious and critical metals. However, there has been a decline in the discovery of new significant mineral deposits because large areas of Australia are covered by younger sedimentary rocks. Developing new approaches to use these sedimentary rocks as an exploration tool is a key challenge. One approach is to use the chemistry of detrital minerals in sedimentary rocks to identify regions of prospectivity. This project will provide the fundamental science required to understand the stability of detrital minerals in sedimentary rocks and the potential for the formation of non-traditional critical metal deposits through the breakdown of detrital minerals. The outcomes of this research will inform the use of detrital minerals as an exploration tool, and thus will be directly applicable to mineral exploration research being undertaken by Australian universities, government and industry.	75,530.50	142,413.50	132,679.00	65,796.00	416,419.00
	University of South Australia	148,080.50	287,613.50	278,429.00	138,896.00	853,019.00
	South Australia	432,491.50	850,748.50	831,127.00	412,870.00	2,527,237.00

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Approved Organisation, Approved Research Program Leader of Approved Research Program		Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
Tasmania						
University of Tasmania						
DE210100606 Nash, Dr Kirsty L	This project aims to track variability in flows of essential micronutrients through marine food webs, to quantify how environmental changes will affect micronutrient supply to humans in seafood – findings that will be highly significant as governments grapple with increases in both malnutrition and ecological degradation. Expected outcomes: world-first models for accurately estimating nutrient production from SE Asian reef fisheries up to 2050, under conditions of predicted climate change. Major expected benefits: new capacity to plan for food and nutrition security into an uncertain future, for Australia, our region, and beyond; with improvements to human nutrition and health, in accord with UN Sustainable Development Goal 2 (Zero Hunger).	75,500.00	149,700.00	149,700.00	75,500.00	450,400.00
	National Interest Test Statement Seafood is a core part of Australia's recommended diet. Much of our demand for seafood is met through trade (more than 30% comes from SE Asian nations), a trend likely to continue under the National Food Plan. But climate change and human activities will alter ecosystems over the coming decades, affecting the yield and composition of fishery catches, and in turn the production of essential micronutrients found in seafood. We do not understand how these changes in micronutrient availability from seafood will unfold, so decision-makers are ill equipped to plan for food and nutrition security into the future. This project will develop the first predictive modelling of micronutrient production from fisheries in SE Asia up to 2050, helping to future-proof Australian policy (fisheries management, public health, and trade) against the effects of climate change and environmental changes more generally. Expected further benefits for Australia are enhanced capacity in science relating to food and nutrition security, and higher international standing and collaborative opportunities in an increasingly important field.					
DE210100784 Curnin, Dr Steven W	This project will use empirical investigation to develop a multidimensional model depicting the organisational practices that are vital for quickly establishing and maintaining trusting relationships in emergency management collaboration. Trust is the crucial but often neglected element that determines the success of collaboration. Expected outcomes include the creation of the first rigorously established knowledge base for understanding what mechanisms are effective to overcome conflicting cultures in Australian emergency management arrangements and successfully build trusting relationships. This should provide significant benefits for all organisations when collaborating in the response to, and recovery from, disasters.	67,158.00	133,206.00	133,206.00	67,158.00	400,728.00
	National Interest Test Statement Disasters require those involved to collaborate. Effective collaboration in emergency management requires organisations from the public, not-for-profit and private sectors to trust each other. Differing organisational cultures can be a barrier to trust. Creating the first rigorously established knowledge base for understanding what organisational practices are effective to overcome conflicting cultures in emergency management and successfully build trusting relationships will contribute to enhancing collaboration. This project addresses one of the Australian Government Science and Research Priorities that seeks to build Australia's capacity to respond to environmental change and associated natural disasters. In doing so, this research will contribute to enhancing a national level of disaster resilience. This can result in sustainable economic growth and well-being.					
	University of Tasmania	142,658.00	282,906.00	282,906.00	142,658.00	851,128.00
	Tasmania	142,658.00	282,906.00	282,906.00	142,658.00	851,128.00

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Victoria						
Deakin University						
DE210100513 Rowe, Dr Emma R	The aim of this study is to investigate the efficacy of philanthropic public-private partnerships to improve equity in public education, focusing on school resourcing and achievement gaps. By engaging directly with public school communities and policy actors, the study examines how newly-emerging venture philanthropic partnerships may be reorientating traditional governance, driving incentivist policy and influencing practice at school, state and Commonwealth level. Whilst venture philanthropy has grown at unprecedented levels globally, a benefit of this study is to improve understanding of national benefits and risks of philanthropic public-private partnerships in public schools and innovative solutions for enduring equity problems.	66,943.00	134,592.50	136,752.50	69,103.00	407,391.00
	National Interest Test Statement In recent years, Australia has experienced a significant growth of infrastructure designed to bolster venture philanthropy and public-private partnerships in public education. However, as a relatively new initiative in Australia, we currently have little understanding of the efficacy of public-private partnerships in public education and the capacity of the partnerships to boost educational equity, improving school effect and school resourcing. Furthermore, without any long-term national studies of venture philanthropy, we have little understanding of efficacy of practice, or how equity is effectively measured. This study will engage directly with public school communities and key stakeholders to understand the impact of philanthropy for school governance, policy and practice; and its capacity to develop innovative responses to enduring global challenges such as educational equity. With a gap of three years of schooling between the most advantaged and disadvantaged schools, in addition to a growing school effect, it is urgent and timely.					
DE210101029 Trevathan-Tackett, Dr Stacey M	This project aims to investigate how plant litter breakdown in wetlands controls soil carbon preservation by identifying the climatic, environmental and microbial drivers of decomposition on a global scale. This project will generate new knowledge in the area of freshwater and coastal wetland ecology using interdisciplinary approaches in biogeochemistry and microbial ecology. Outcomes of this project include novel global datasets that will identify why some wetlands preserve carbon better than others and what management practices can enhance sequestration capacity. This should provide significant benefits, including advancing carbon-cycling models and predictions, and improving capacity to manage and restore wetland function.	77,110.00	154,268.00	154,271.50	77,113.50	462,763.00
	National Interest Test Statement Wetland ecosystems provide important services, including enhancing biodiversity, filtering pollutants and sequestering greenhouse gases. However, continued wetland degradation and loss pose a serious threat to the ecological, socioeconomic and climate-buffering services they provide to Australians. By examining the factors that have the potential to maximise wetland carbon preservation and sequestration, the project addresses government-identified priorities for research on climate change and soil health. This research will enable the identification of the conditions that maximise carbon sequestration, the understanding of the impact that management and restoration efforts have on current and future soil carbon preservation, and improved capacity and accuracy to predict carbon responses to environmental change. The outcomes can be utilised by Australian climate modellers, land managers, soil and wetland ecologists, and local communities to improve the evaluation of wetland ecosystem function, health and services.					
DE210101145 Sundaramoorthy, Dr Vinod	This project aims to better understand the biology and functioning of the nervous system using an innovative multi-disciplinary approach informed by the rabies virus. The study intends to identify the molecular mechanism responsible for self-destruction in neurons. The project aims to gain this new knowledge by investigating the novel natural ability of rabies virus to subdue self-destruction mechanism in neurons. The principal benefit is the gain of detailed knowledge about a fundamental biological mechanism at the intersection of neurobiology and virology. This has the potential to inform future research in areas such as the maintenance of neuronal health in ageing and better control of rabies infections.	72,822.50	142,134.50	134,508.50	65,196.50	414,662.00

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	National Interest Test Statement This project aims to deliver benefits to the Australian community by knowledge gain in two distinct science areas. Firstly, this project aims to generate new knowledge about the biology and functioning of neurons. This fundamental knowledge is imperative for future research that could identify applications in maintaining a functional nervous system during ageing. Hence this basic research would contribute towards filling an important knowledge gap in neurobiology, which could lead to future strategies for reducing the social and economic impact of a rapidly increasing ageing population in Australia. Secondly, this project aims to uncover novel knowledge about the lethal rabies virus. This study intends to discover how rabies adapts to animal host species to produce an optimal infection and efficient transmission to a new host. This new knowledge about the virus could contribute to future research programs directed towards managing the on-going threat of rabies. This will contribute to strengthening Australia's leadership in managing emerging regional health threats in the Asia-pacific region.					
DE210101168 Connell, Dr Timothy U	This project aims to improve the performance and longevity of molecular photocatalysts to produce hydrogen from water and visible light. Sustainable alternatives to fossils fuels, such as hydrogen, are critical to minimising the effects of climate change. This project expects to use innovative experimental techniques to reveal the causes of degradation in key intermediates of the photocatalytic reaction. Understanding these detrimental pathways can then direct the design of new catalysts with enhanced stability and activity. The fundamental chemistry explored in this project should advance breakthroughs in artificial photosynthesis and provide cleaner methods of hydrogen production under mild conditions, using earth-abundant catalysts.	72,500.00	145,000.00	142,500.00	70,000.00	430,000.00
	National Interest Test Statement Exploiting Australia's abundant sunlight to produce hydrogen from water by photocatalysis is expected to expand Australia's capabilities in low-emission solar technologies. This project expects to address the current limitations of molecular photocatalysts and invent new strategies for clean hydrogen generation that are both efficient and stable. These outcomes will provide significant environmental benefits to Australia as current production methods generate high levels of pollution and hinder the rollout of hydrogen as a fossil fuel alternative that is more readily stored and transported than solar electricity. Low-cost sustainable hydrogen will also provide significant economic benefits to key Australian industries, including iron ore refinement and fertiliser production, and may result in the development of new export markets across Asia. This project is also expected to develop new capacity in automated chemical discovery and analysis, providing a valuable training program producing research scientists with emerging skills critical to supporting the expanding Australian chemical manufacturing industry.					
DE210101623 Asadi, Dr Houshyar	This project aims to address the key deficiencies of driving and flight simulators by developing novel human perception-based motion cueing algorithms (MCAs) and leveraging advanced artificial intelligence techniques. Despite widespread applications, existing motion simulators fail to deliver the most accurate human sensation to the user. This failure is mainly attributable to the inefficiency and inflexibility of MCAs used by simulators. It is expected that this project will significantly increase simulator motion fidelity and eliminate motion sickness. This will have substantial benefits to Australian research communities and industries, particularly where simulators are used for training, performance evaluation and virtual prototyping.	76,455.50	152,940.00	151,769.50	75,285.00	456,450.00
	National Interest Test Statement The social and emotional impact of road crashes in Australia and their economic cost ($27 billion per annum) can be significantly reduced by using motion simulators for driver training, driving behaviour and performance evaluation and safety purposes. In addition, vehicle testing is currently conducted using real prototypes during various design stages, which makes the process of new vehicle design and performance evaluation highly expensive and time-consuming for vehicle manufacturers and risky for test drivers. These drawbacks can be greatly reduced through use of motion simulators for virtual prototyping in Australia. Low fidelity and motion sickness are key drawbacks of existing simulators which demotivate participants and therefore negatively affect outcomes of training, user behavior analysis and virtual prototyping. This project aims at addressing these by developing new motion cueing algorithms. The outcomes will provide the user with realistic virtual driving experience, thereby paving the way for far greater and more widespread applications.					
	Deakin University	365,831.00	728,935.00	719,802.00	356,698.00	2,171,266.00

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La Trobe University						
DE210100151 Millar, Dr Erica R	This project aims to understand how ingrained institutional abortion stigma produces barriers to access. Despite progressive law reform, access to abortion in Australia remains uneven and discriminates against the most marginal women. Institutions of law, government, medical training and health care significantly influence access to abortion. The nature and extent of this influence is under-researched and poorly understood. The project expects to identify and begin enacting the institutional-level change required for more equitable access to reproductive health care. The anticipated benefits include developing tools to optimise abortion access and, in so doing, helping to meet a goal repeatedly highlighted by State and Federal governments. **National Interest Test Statement** Abortion provision in Australia is uneven and discriminates against the most marginal women. Now that the long-standing goal of decriminalising abortion has largely been achieved, women's access to abortion must be guaranteed. Currently, underappreciation of the central role that certain institutions play in regulating abortion hampers the success of state and Commonwealth reproductive health policies that identify improved access as a core priority. This is the first in-depth study of the key institutions that regulate abortion provision: institutions of law, government, medical education and training, and health care provision. It examines how institutional norms, practices and policies form barriers to abortion access that are felt most acutely by women who are already disadvantaged. Embedded stakeholder engagement will transform this knowledge into specific tools and strategies for addressing ingrained abortion stigma within institutions. By understanding and transforming institutional cultures and practices, the project aims to improve equality of access to reproductive health care in Australia.	73,502.50	142,482.50	142,443.00	73,463.00	431,891.00
DE210101200 Khan, Dr Ghazanfar A	This project aims to transform our understanding of the relationship between nutrient availability and plant defence. Plant defences are activated by responses to cell wall damage, caused by pathogens. My preliminary data uncovered that the response to cell wall damage depends on the nitrogen status of the plant; providing a direct link between nutrients and defence. The research will use new mutants that disengage this link to uncover molecular mechanisms underlying this process. The outcomes will provide new approaches to breed crop plants with improved nitrogen use efficiency and disease resistance. It will benefit agriculture by reducing the use of costly fertilisers and pesticides and mitigate the huge environmental damage they cause. **National Interest Test Statement** Australian agriculture is an integral part of the nation's economy worth around $66 billion in 2017-2018. A key objective for Australia's agriculture industries is to increase productivity per hectare, as there is little immediate scope to expand the area planted with conventional crop species. Nitrogen-based fertilisers and pesticides for crop protection are the principal cost factors in modern day agriculture. The aim of this project is to increase our knowledge of how to improve plant performance through optimising nitrogen management and reducing pesticide use. This project will therefore not only improve plant productivity and increase agricultural profitability through lower costs but provide food security and reduce environmental pollution arising from excessive use of nitrogenous fertiliser and pesticides.	75,312.50	150,875.00	151,525.00	75,962.50	453,675.00
DE210101244 Westendorf, Dr Jasmine-Kim	This project aims to conduct the first systematic study of the nature, scale and impacts of sexual exploitation and abuse by civilian interveners in humanitarian operations. It will generate data on the nature and effects of such abuses and evaluate current policy responses. Expected outcomes include an enhanced understanding of this misconduct and how intervener behaviours affect the outcomes of international operations, the development of data collection tools of use to industry and policy recommendations. This will contribute to more effective international engagement in humanitarian and conflict contexts, better protection for vulnerable communities and will help address the legitimacy crisis facing humanitarian action and peacekeeping.	74,405.00	146,301.50	144,592.00	72,695.50	437,994.00

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	National Interest Test Statement This project contributes to Australia's national interests by (1) providing practical recommendations on policies on sexual exploitation and abuse in humanitarian operations globally; (2) informing prevention and accountability mechanisms, thereby improving effectiveness of humanitarian operations to which Australia contributes; and (3) developing data collection tools for sexual misconduct in humanitarian operations, of use to both practitioners and scholars. Australia plays an important role in global peace and humanitarian efforts, particularly in our region. Its recent tenure on the UN Security Council was in part secured on account of Australia's leadership on issues of Women, Peace and Security. As a significant contributor to peace and humanitarian operations, it is in our interest to lead policy and scholarly discussions on how to improve the effectiveness of those operations, protect the world's most vulnerable populations from harm by those sent to protect them, and ensure that global perceptions of the legitimacy of such operations are not undermined by instances of sexual exploitation and abuse.					
DE210101348 Gamble, Dr Ruth E	The Himalaya's cryosphere (or frozen realm) has underpinned Monsoonal Asia's climate and water supply for millennia, and now it is disappearing. This project forecasts the Himalaya's melting future by documenting how its ice has shaped Asia's past and produced its present. Focusing on the period since the end of the Little Ice Age (the mid-1800s), it investigates the climatic, cultural and geopolitical causes of ice loss, and asks how they have influenced and intensified each other. The project's multifaceted approach to the cryosphere challenges the current fragmented debates on the melting ice, and will, therefore, generate improvements in cryosphere management.	62,820.50	125,993.50	122,136.00	58,963.00	369,913.00
	National Interest Test Statement The Australian Government's aid program invests heavily in river management within the Greater Himalayan Watershed. The Sustainable Development Investment Portfolio, the South Asia Water Initiative, and Australian Water Partnerships run programs in the Indus, Ganges, Brahmaputra and Mekong River Basins. This investment recognises that Himalayan rivers sustain approximately 45 per cent of the world's human population and 20 per cent of its economy, underpinning trade, and socio-political stability in our region. Despite this investment, Australia has supported only limited research into the Himalayan cryosphere (icy realm), which provides around 40 per cent of this watershed's flow and faces profound challenges from climate change. This environmental history project will produce new and accessible, world-leading insights that explain the dynamic ecologies, societies and politics of the icy realm to Australians, our regional partners and the world. It will lead to more effective cryosphere management policy and advance Australia's regional interests.					
	La Trobe University	286,040.50	565,652.50	560,696.00	281,084.00	1,693,473.00
Monash University						
DE210100012 Hessami, Dr Viviane	This project aims to enable more effective and culturally-sensitive information dissemination programs and digital preservation programs based on an analysis of the differences between the information needs and preferences of women and men in rural communities in developing countries. This project is expected to develop a theory of gendered recordkeeping and a framework for the application of gender-sensitive and culturally-sensitive information dissemination and information preservation programs. Expected outcomes include economic and social benefits for rural and disadvantaged communities through the empowerment of creating and preserving information in ways that meet personal and community needs and preferences.	67,012.50	138,202.00	132,702.00	61,512.50	399,429.00
	National Interest Test Statement This project will uncover gender-specific information preferences for rural and disadvantaged communities within developing countries from our region. The project will develop a new framework for the best ways to disseminate and preserve information for those groups. This will have wide-ranging implications for digital and gender equity that will be relevant for rural communities and disadvantaged groups around the world. The outcomes will generate tangible benefit for Australia in guiding the delivery of information from Australian aid organisations and Commonwealth bodies in the developing world as well as informing Australian Government policy in the area of digital access. Specifically, the research will inform the implementation phase of the Australian Government Digital Continuity 2020 policy to ensure equitable and effective access to essential information services for disadvantaged Australians.					

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DE210100019 Yu, Dr Jiangshan	This project aims to address the security and scalability challenges that limit blockchain adoption. Existing blockchains do not scale and are vulnerable to attacks (e.g. with a total loss of over US$1 billion in 2019). This project expects to improve security by adaptively enforcing the currently broken security assumptions, and to improve scalability by designing blockchains with high concurrency via relaxed criteria on the ordering of transactions. The expected outcomes include foundations and practical solutions for self-adaptive, secure and scalable blockchains. The benefits of this would be improved confidence in and capacity for building blockchain applications, which have a predicted value of over US$3.1 trillion by 2030.	68,000.00	136,000.00	136,000.00	68,000.00	408,000.00
	National Interest Test Statement The expected outcomes of this project will help reduce damages (over US$1 billion lost in 2019) caused by cyberattacks on blockchains, and protect and seize the opportunities presented by the blockchain ecosystem, which is predicted to reach over US$176 billion in value by 2025. Notable applications of blockchains range from the financial field to supply chains and digital health. They could present an enormous opportunity to create jobs and support the growth of Australian businesses, as expected by Data61 and the Australian Computer Society. For example, a secure and scalable blockchain could help provide provenance in the food industry, to save potentially AU$40–AU$50 billion a year, and help cut the banks' infrastructure costs by AU$15–20 billion annually by 2022. This project will contribute to the Australian Government's National Blockchain Roadmap, which aims to help position Australia's blockchain industry to become a global leader. It also addresses the National priority of Cybersecurity, with additional support to other priorities as blockchains promise to disrupt many industries.					
DE210100056 Hu, Dr Yaoxin	This project aims to develop a daytime radiative cooling surface without external energy requirement via novel microstructured nanohybrid film coatings to perpetually dump heat into cold outer space through the atmospheric window. The project expects to generate new fundamental knowledge in the area of building cooling materials, via multidisciplinary utilisation of cutting-edge construction materials and design. The expected outcome of the project will place Australia in a competitive position in advanced green building infrastructure and highly demanded energy-saving technologies. This should provide benefits, such as significantly decreasing building energy consumption, and, thus reducing greenhouse gas emission.	72,291.00	144,582.00	144,582.00	72,291.00	433,746.00
	National Interest Test Statement An outcome of this work would be a new generation of passive daytime cooling surface which significantly improves the energy conservation efficiency and sustainability of buildings, placing Australia in the vanguard of resource and renewable energy technology. Compared with a costly cooling system upgrade, painting advanced coating films on various types of existing roofs is a cost-effective approach for energy saving. The developed microstructured nanohybrid films can passively dump heat into outer space through atmospheric window achieving sub-ambient temperature. This cutting-edge technology and associated commercialisation opportunities will directly benefit the building-related industry in Australian and global markets. This project will also provide benefits to Australian construction materials industry via the invention of high value-add products; Australian electricity grids by reducing the energy demand of building cooling systems; local communities through the mitigation of urban heat island effect; and global environmental change by cutting greenhouse gas emission and ozone-depleting coolants.					
DE210100092 Li , Dr Luzhou	This project aims to investigate outbound Chinese social media platforms such as TikTok and the regulatory issues they raise. Chinese platforms are rapidly expanding in Australia and globally, yet they are poorly regulated, leading to the circulation of inappropriate and illegal content. This project expects to advance policy knowledge of the overseas operations of Chinese platforms, their self-regulatory measures, and external regulatory options. Expected outcomes of the project include improved understanding of the policy and regulatory implications of outbound Chinese platforms. Expected benefits include suitable policy advice on regulation of these platforms in Australia, targeted at reducing public exposure to harmful content.	68,107.00	137,855.00	133,518.00	63,770.00	403,250.00
	National Interest Test Statement Chinese social media platforms are rapidly expanding globally. There is some concern that these platforms are poorly regulated and permit content that may be illegal and/or damaging to the public and democracy. This project investigates how Chinese social media platforms are operating outside of China. Using increasingly popular short-video social media platforms such as TikTok as the focus of the research, the project examines how these companies self-regulate content. Gaps in current governmental and industry regulations relevant to these platforms will also be highlighted, and potential regulatory improvements identified. The project results will benefit Australia by providing insights that could guide policy makers and regulators in developing more effective regulatory frameworks and guidance for content developers. In so doing, the project offers insights into better ways of protecting the public from inappropriate content.					

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DE210100137 Bajaj, Dr Ayushi	This project aims to analyse the impact of global trade and financial uncertainty on the Australian economy and provide quantifiable policy prescriptions. This project expects to generate new knowledge in the area of monetary and macroeconomic policy using an innovative approach with search and matching frictions, to formalise how investors respond to higher uncertainty given their liquidity requirements. The intended outcomes of the project include offering a new theory with the potential to guide future research and novel quantitative application to Australian macroeconomic data. This should provide significant insights for institutions such as the Reserve Bank of Australia and benefits through the design of policy. **National Interest Test Statement** Policymakers across the globe, including in Australia are worried about the role that high uncertainty plays in slowing down economic activity. An improved understanding of the mechanisms, effects and significance of increased global trade and financial uncertainty, especially for open economies like Australia, will contribute to more informed policy by institutions such as the Reserve Bank of Australia. The theoretical framework and its policy implications will be a key benefit of this project for the academic community as well as for policy makers. The other significant contribution of this project will be its quantitative application. By making our results and software open source, this project will allow for future scientific replicability and will also reduce the barriers to other researchers using or extending the framework.	57,158.00	119,349.00	116,786.50	54,595.50	347,889.00
DE210100375 Winship, Dr Amy W	This project aims to investigate fundamental biological mechanisms required for the production of high-quality oocytes, which fortify female fertility and the propagation of all sexually reproducing species. Exploiting unique mouse models, this study will define the importance of single strand DNA break repair capacity in oocytes for the first time, by outlining the role of single strand DNA repair proteins in maintaining genetic integrity of gametes throughout their lifespan. In doing so, the intended outcome of this project is to dramatically improve our understanding of quality control in the female germ line. This should provide significant benefits to Australia by positioning it as a world leader in the field of Reproductive Science. **National Interest Test Statement** Sexually reproducing female mammals are born with their entire lifetime supply of oocytes (eggs). The immature oocytes stored in the ovary are very long-lived and the storage unit for genetic information that will be passed onto offspring. For this reason, oocyte DNA integrity must be preserved to ensure fertility and offspring health. Oocyte DNA damage can occur in response to normal, daily cell processes, or after exposure to chemicals, like air pollutants, or pesticides. This project will provide vital new insight into the fundamental mechanisms employed by oocytes to maintain their genetic integrity. The new information generated from these studies could contribute to emerging national and international challenges in fertility and reproduction, including the preservation of Australia's threatened native fauna and the successful breeding and productivity of domestic livestock.	68,707.00	142,868.00	145,388.50	71,227.50	428,191.00
DE210100416 Kanai, Dr Akane K	This project aims to investigate how young women engage with socially significant knowledge about gender inequality in social media groups and online discussion forums, and how they use this knowledge. This project expects to generate new knowledge by explaining how online environments shape knowledge acquisition for young people, using an innovative digital ethnographic approach. Expected outcomes include practical guidelines for assessing the positive and negative aspects of online culture as a pedagogical resource. This should provide significant benefits in helping young people to better navigate online cultures and to recognise, negotiate and, wherever possible, overcome gender-based inequality in their lives. **National Interest Test Statement** Online culture is central to how young people form their identities and learn about inequalities and divisions in society. This project will investigate the ways in which young women learn about gender inequality through online social media groups and discussion forums. Because information is easily accessible to digitally connected young people, it has changed how young people acquire knowledge outside of formal educational institutions. However, the information used online to analyse social division and inequality is often polarised, personalised, and difficult to verify. This presents challenges for young people and wider society in learning how to engage with the sources of information that shape their lives. The project will produce evidence on the benefits and challenges in using online knowledge to navigate experiences of gender inequality. The social benefits of the project include practical guidelines for assessing, analysing and using online political knowledge. These guidelines should be of use to young people, government, and community and industry stakeholders working with young people.	70,071.50	139,523.00	140,950.50	71,499.00	422,044.00

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DE210101030 Walsh, Dr Jessica W	The project aims to develop novel decision-support tools to cost-effectively recover threatened ecosystems, through landscape-scale, evidence-based ecological restoration. This project expects to develop strategic frameworks to reverse ecosystem declines and promote recovery using a novel combination of ecological theory, expert elicitation, evidence synthesis and prioritisation techniques. Anticipated outcomes include decision-support tools for setting realistic recovery goals, identifying effective restoration actions and planning for full recovery of threatened ecosystems. This project should provide significant benefits to the Australian federal and state governments, by informing policy and management of threatened ecosystems. **National Interest Test Statement** Ecosystems, such as forests, wetlands and grasslands, provide habitat for biodiversity, including threatened species, and provide ecosystem services, such as water and food provision, erosion prevention, storm surge protection and carbon storage. They also contribute to Australia's economy through tourism, agriculture, forestry and fisheries. However, 84 ecosystems are threatened nationally with collapse and many others are threatened by drought, changing fire regimes, vegetation loss and invasive species. This project will increase our ability to effectively restore and conserve threatened ecosystems, through the use of scientific evidence, ecological modelling and cost-effectiveness analyses. It will assist in meeting Australia's international obligations to the Convention on Biological Diversity and United Nations Sustainable Development Goals, by informing how to restore threatened ecosystems with limited resources while maximising success.	75,058.00	149,827.00	146,261.00	71,492.00	442,638.00
DE210101031 Shahine, Dr Adam E	This project aims to undertake discovery research to investigate the molecular mechanisms underpinning the role of lipids in T cell immunity: an emerging area of immense biological significance. The anticipated goal is to generate new knowledge in the areas of the life sciences, by using a multidisciplinary approach that includes structural biology, mass spectrometry, biophysics, and cellular immunology, to gain fundamental insight into molecular determinants that govern lipid mediated immunity. Expected outcomes and benefits of this project include building international and interdisciplinary collaborations to enhance national research capacity, and provide marked advancement of core knowledge in the biological sciences. **National Interest Test Statement** The importance of lipids in T cell immunity has only recently become apparent. The intended benefit of this research is in the generation of fundamental knowledge in the new field of lipid-mediated T-cell biology, laying the foundation for future growth. The project will generate novel insights into critical functions of this new area of immune function and pioneer avenues for future biomedical research and targeted responses to immune dysfunction. The project will provide a foundation for future biotechnological and therapeutic interventions through the creation of valuable intellectual property and will establish a multitude of biochemical, immunological, and structural technology platforms to probe questions in this new field to generate health and economic benefits for Australia.	74,776.50	151,904.00	154,283.50	77,156.00	458,120.00
DE210101056 Saunderson, Dr James F	This project aims to develop and analyse new mathematical and algorithmic methods for polynomial optimisation and decision problems. In doing so it expects to generate knowledge and tools in mathematical optimisation that build on recent developments in the theory of hyperbolic polynomials. Expected outcomes include more scalable and/or reliable methods for polynomial optimisation and safety verification of dynamical systems, and theory explaining the power and limitations of these methods when compared with existing approaches. Possible benefits include safer and more reliable complex engineered systems, such as the power grid or interacting autonomous vehicles, verified by methods built on those developed in the project. **National Interest Test Statement** Optimisation involves finding the best possible solution (with respect to a goal) to problems such as planning, resource allocation, or engineering system design, while respecting limitations imposed by constraints. Goals of interest could include minimising energy consumption or maximising quality of service. Constraints of interest could include ensuring the feasibility, reliability, or safety of an engineering design. The proposed research aims to develop optimisation techniques, based on new ideas in mathematics, that could make it possible to solve optimisation problems that are out of reach for current methods. For example, in the design of engineering systems that move autonomously, like robots interacting with humans or autonomous vehicles, these new techniques could improve the way constraints ensuring safe operation are imposed. This research could give Australia's high-tech industry a significant competitive advantage though access to the latest and most powerful optimisation methods, while maintaining its reputation for reliability and safety.	65,962.50	131,925.00	131,925.00	65,962.50	395,775.00

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DE210101427 Chobanova, Dr Veronika	This project aims to reveal the existence of elementary particles never observed before or of new forces of nature by studying data collected by the LHCb experiment. LHCb is situated at the world's most powerful particle accelerator, the Large Hadron Collider. The studies are expected to generate new knowledge in the field of particle physics and could resolve long-standing puzzles such as the composition of the Universe. The project aims at optimally exploiting LHCb data by using an innovative measurement approach based on advanced computational and machine learning techniques. It should enhance the capacity in particle physics and should create new collaborations with Europe, benefiting the diversity of the Australian physics programme.	77,037.50	154,085.00	154,095.00	77,047.50	462,265.00
	National Interest Test Statement This project will develop and apply leading computational and machine learning techniques to the extremely large datasets coming from the Large Hadron Collider, in the search for new fundamental particles. The machine learning techniques developed will be broadly applicable in other fields and in Australian industries which analyse large data sets. The project will further unlock new software development and programming capability with graphics processing units to enable the more widespread use of advanced multivariate analysis in Australian industry. The results are expected to dramatically increase the likelihood of physicists directly observing new particles, termed ''new physics", which can underpin future economic potential through the development of new technologies that exploit them. Through this research, Australia will be in an important position to benefit from these new discoveries. The project will also raise the level of public literacy in particle physics through an outreach program for high school students.					
DE210101433 McCormack, Dr Felicity S	This project aims to provide new insight into how ice flow processes influence Antarctic ice loss - a serious unsolved problem in predicting how much Antarctica will contribute to sea level rise. Using a state-of-the-art ice sheet model and real-world glaciological observations, this project expects to generate new knowledge of the mechanisms, and environmental and climatic conditions that control ice flow. Expected outcomes of this project are improved estimates of Antarctica's contribution to future sea level rise. This project should provide substantial benefits in Australia and internationally, particularly in regions vulnerable to rising sea levels, by producing a sound evidence base for policy and mitigation strategies.	68,087.50	139,350.00	146,434.00	75,171.50	429,043.00
	National Interest Test Statement Sea level rise will have widespread and costly impacts on Australian society, industry, and environment. For example, if sea levels rise by 1.1 m, over $226 billion of Australian infrastructure will be exposed to coastal flooding and erosion. The Intergovernmental Panel on Climate Change's Special Report on the Oceans and Cryosphere in a Changing Climate 2019 predicts 0.61-1.1 m of sea level rise by 2100. The large range in this estimate is due to unknowns in how Antarctic ice flows into the oceans. The outcomes of this research will be more accurate estimates of Antarctica's contribution to sea level rise by 2100 through new knowledge of the processes that control ice flow and ice sheet collapse. The research addresses priorities in the Australian Antarctic Science Strategic Plan 2011-12 to 2020-21, and the Australian Research Council's Science and Research Priority 8: Environmental Change. This research will benefit Australian federal, state, and local policy-makers who are developing cost-effective and reliable climate-change planning, mitigation, and adaptation strategies on sea level rise.					
DE210101479 Grant, Dr Emma J	This project aims to characterise a unique and understudied surface molecule (HLA-E). The immune system is activated and regulated by a complex set of molecules including HLA molecules present on the cell surface that inform the immune system of infection. Therefore, this project expects to generate new knowledge in the areas of cellular biology and immunology by utilising a cutting-edge and multi-disciplinary approach. Expected outcomes of this project include the generation of new knowledge of this unconventional molecule and its interaction with immune cells. This should provide significant impacts by defining the non-conventional role of HLA-E within the immune system, which may advise future research into vaccines or therapeutics.	73,158.00	149,316.00	152,316.00	76,158.00	450,948.00
	National Interest Test Statement This project will generate knowledge in a new area of cellular biology and immunology, probing the role of an understudied molecule (HLA-E) in the immune system. Up until now, this molecule has only been studied in one side of the immune system; innate immunity. This project adapts gold-standard techniques to provide fundamental knowledge on the role of this molecule in the immune response across both adaptive and innate immunity. The results will provide insights into complex immune function that could ultimately yield a new pathway for anti-viral therapeutics or vaccine targets. Valuable intellectual property underpinning these discoveries could generate future patents and attract commercial partners to ultimately produce Australian health and economic benefits through existing industry links.					

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DE210101568 Sweeney, Dr Rohan P	This project aims to increase effectiveness of Australia's health aid program in the Asia-Pacific region by employing advanced health economics methods and working with stellar international collaborators. Australia has committed to better align health aid with recipient priorities, however, there is a need for evidence on how best to achieve this. This project expects to generate new knowledge about the benefits from increased alignment. Expected outcomes include increased regional research capacity and strategies for stakeholders to increase alignment for greater impact. This should benefit Australia's health aid program, so that it meets the expectations of the Australian public and improves the health and wellbeing of aid beneficiaries. **National Interest Test Statement** The Australian Government is currently reviewing its $4billion annual overseas development program and Australians are increasingly interested in understanding how Non-Government Organisations (NGOs) can maximise the impact of the Australian public's AU$264million annual donations. This project will provide urgently needed evidence for the Australian Government and NGO community to improve the impact of their international health aid programs. Specifically, it will provide evidence on (i) where health aid funding does not align with recipient priorities in the Asia Pacific region, (ii) the extent that increased alignment could impact on the effectiveness of health aid, and (iii) strategies to improve the alignment of donor and recipient health aid priorities. Increasing the impacts of Australia's aid on health, wealth, wellbeing and climate resilience of recipients in the Asia Pacific Region also benefits the Australian population. For example, by reducing the health and economic costs of disease transmission into Australia and reducing the extent of migration in the region driven by changing climate.	59,035.50	118,455.50	115,528.00	56,108.00	349,127.00
DE210101569 Carland , Dr Susan J	This project aims to identify and document the initiatives being used by Muslim women to counter Islamophobia and build social cohesion in the community. It also examines how these initiatives are received by the community. The project expects to generate new knowledge on the role of gender in creating social cohesion and countering Islamophobia through interviews with Muslim women who lead such initiatives. Expected outcomes of this research include improved theoretically-informed approaches for addressing Islamophobia. This should provide significant benefits including a better understanding of what works in addressing Islamophobia and building social cohesion, and clarity for guiding funding aimed at supporting such initiatives. **National Interest Test Statement** Islamophobia remains a problem in Australia, and continues to undermine efforts to build social cohesion in the community. This project will examine how Australian Muslim women develop and lead community initiatives designed to reduce Islamophobia and improve social cohesion. The project also seeks to understand how these initiatives are received by both non-Muslims and Muslims. The Australian government has made social cohesion a funding priority, however it is important that this funding is directed at initiatives that are informed by evidence on their potential usefulness. This project will benefit Australia by providing new knowledge to build social cohesion and help reduce Islamophobia in our communities, and clarify the role of gender in this work. This could provide significant social benefits to communities seeking to improve social cohesion, and economic benefits through more effectively targeted funding for social cohesion initiatives that are supported by an evidence base.	68,710.50	141,606.50	133,687.00	60,791.00	404,795.00
DE210101669 Uckelmann, Dr Michael	This project aims to address the fundamental question of how genes are switched off by studying a group of molecular off-switches, the polycomb group proteins. The project is expected to generate new knowledge in the area of gene regulation and epigenetics by combining innovative methods of structural biology and cell biology in an interdisciplinary way. The expected outcomes include a more complete picture of the molecular mechanisms that regulate gene expression and the development of novel methods to image the genome. This should provide significant benefits, such as facilitated development of gene editing tools and regulatory circuits for synthetic biology, as well as novel capabilities to image the genome at high resolution **National Interest Test Statement** This proposal aims to generate a more complete picture of how genes are switched on and off during development of an organism, a process essential for all multicellular life. A class of molecular off-switches will be studied using cutting-edge structural biology methods only few labs in the world can master. Specifically, this proposal's benefits include: - Development of novel cryo-electron microscopy based techniques to image the structure of genes, an application unique in the world. This should attract international research talent and students, boosting the education sector, Victoria's largest service export industry and a priority sector. - A more complete understanding of fundamental mechanisms of gene regulation which allows generation of better gene editing tools. These can provide economic benefit to industry relying on gene editing, such as agribusiness, through cheaper, faster or more precise editing. - A mechanistic understanding of gene regulation should directly promote introduction of novel regulatory circuits in synthetic biology which can promote growth of this new biotech sector	68,120.00	141,329.50	147,122.50	73,913.00	430,485.00

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DE210101923 Jones, Dr Richard S	This project aims to unearth the characteristics and controls of Antarctic ice sheet loss on timescales of 100s to 1000s of years. The polar ice sheets are getting smaller at an accelerating rate in response to a warming climate, but modern observations are not yet sufficient to determine whether current ice sheet loss marks the start of irreversible retreat. Through a combination of novel geological approaches and numerical ice-flow modelling, this project expects to generate new knowledge on the rates and magnitudes of ice sheet loss, and the processes that will dictate the amount of ice loss in this century and beyond. This work should be beneficial for managing the societal, economic and environmental impacts of future sea-level rise. **National Interest Test Statement** This project is expected to expand current knowledge of how, where and why polar ice sheets lose mass, and whether current ice loss is temporary or irreversible. It will lead to more accurate and precise predictions of future sea-level rise in a warming climate, which will allow for more effective mitigation and adaptation. Managing the impacts of sea-level rise will be a societal, economic and environmental challenge for the coastal populations of Australia, which feature the country's largest cities – Sydney, Melbourne, Brisbane, Perth and Adelaide. The consequences of sea-level rise include increased coastal flooding, coastal erosion and loss of beaches, with substantial effects for communities, infrastructure, industries and ecosystems. Reducing the uncertainty of future sea-level rise is crucial in order to know how much damage to expect and how much money to spend protecting the Australian coastline.	72,708.00	146,053.50	132,828.50	59,483.00	411,073.00
	Monash University	1,174,001.00	2,382,231.00	2,364,408.00	1,156,178.00	7,076,818.00
RMIT University						
DE210101181 Khodadadian Gostar, Dr Amirali	This project aims to develop a mathematical framework to combine multi-modal information coming from multiple sensors. These mobile sensors will be spatially distributed over a large-scale area for the purpose of multi-object tracking. The main application of this framework is for cooperative perception for intelligent decision making. Expected outcomes include a novel technique to integrate receiving information from multiple mobile agents (e.g. vehicle) to enhance their ability to anticipate situations in dynamic environments and to act effectively to enhance safety. This should provide benefits for the development of cooperative autonomous driving to enhance road safety. **National Interest Test Statement** By 2056 the population of Australia is expected to reach 30 million people. This will give rise to more vehicles on our roads, exacerbating the issues of road safety, environmental pollution and congestion. Currently, about 1300 people die in vehicle incidents, and 36,000 are hospitalized in Australia per year. Furthermore, transport is the third-largest and fastest-growing source of greenhouse gas emissions in Australia and annual congestion-related costs for the Australian economy is estimated at $40 billion by 2031. Improving the effectiveness of Australian transportation systems will have significant social, environmental and economic impacts. The outcomes of this project offer the potential to significantly improve decision-making mechanisms of future transportation systems. The major part of this promise is based on the development of a rigorous mathematical framework that provides the necessary perception and planning abilities for transportation systems, especially cooperative driving which will have positive social and environmental effects by reducing traffic accidents, traffic jams and pollution.	65,962.50	133,925.00	135,925.00	67,962.50	403,775.00
DE210101503 Zhang, Dr Duyao	This project aims to develop a new class of titanium alloys by 3D metal printing that have excellent mechanical properties. The project expects to develop the knowledge to overcome the problems of conventional titanium alloys that have undesirably coarse columnar-grained microstructures. The expected outcome is a new design strategy for the use of 3D printing to make metal alloys This should lead to the widespread adoption of 3D metal printing for the production of structural parts for which reliably high-quality mechanical properties are of the utmost importance, and could transform the use of titanium in the biomedical and aerospace industries.	70,047.50	139,762.50	140,247.50	70,532.50	420,590.00

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	National Interest Test Statement This project will address the current shortage of titanium alloys specifically for metal 3D printing by developing new titanium alloys with greater strength than that currently used in industry. The new developed 3D printed titanium alloys to be delivered by this project have a great potential to meet the need for high mechanical performance applications in aerospace (e.g. structural components) and biomedical (e.g. implants, dental applications) industries. In addition, new alloys with high strength and optimum solidification behaviour are urgently needed to allow metal 3D printing to be a competitive manufacturing route for high performance components. This project will allow this to be realised and for Australia to maintain its lead in this rapidly developing field. On the other hand, the use of 3D printing for the production of these alloys will save on material, leading to significant cost/energy savings and reduction in carbon dioxide emissions comparing to the conventional foundry processing, hence benefitting to society and the environment.					
DE210101549 Dong, Dr Jingliang	This project aims to remove the long-lasting barrier in extrapolating data from animals to humans by developing an integrated virtual platform. This project expects to fully resolve inhalation exposure differences in nasal airways between commonly used animal surrogates and humans, which could lay scientific underpinnings in developing rigorous interspecies data conversion schemes. Expected outcomes include a versatile inhalation exposure risk assessment tool that can be implemented for any airway compartment, enhanced reliability of animal tests, reduced number of animals for testing. This should provide significant benefits in improving occupational health and safety and promoting National/International regulatory changes.	65,962.50	131,925.00	131,925.00	65,962.50	395,775.00
	National Interest Test Statement This project will develop a new virtual platform to resolve the nanoparticle inhalation exposure characteristics in the nasal airway of animal surrogates and humans. It will allow region-specific interspecies inhalation dose conversion that can be easily adopted by toxicologists and relevant knowledge users. This project will provide a cost-effective approach in identifying occupational exposure risks associated with massive production and use of nanomaterials. Its fundamental discoveries should have far-reaching significance to the Australian Advanced Manufacturing Sector and can help National/International policy authorities in formulating evidence-based guidance documents and regulatory standards for the management of workplace exposure to nanoparticles. The project will contribute towards the global efforts in risk assessment and safety management of airborne nanomaterials in the rapid growth of an emergent technology for risk reduction, improved health and savings on medical expense.					
	RMIT University	201,972.50	405,612.50	408,097.50	204,457.50	1,220,140.00
Swinburne University of Technology						
DE210101050 Powell, Dr Jade	This project aims to perform simulations of core-collapse supernovae, the explosive death of massive stars, to better understand their explosion properties, remnant properties, and gravitational wave emission. This project expects to produce gravitational wave emission predictions in previously unexplored areas of the supernova progenitor parameter space. The expected outcomes of this project include novel gravitational wave data analysis tools, and a better understanding of the birth properties of neutron stars and black holes. This should provide significant benefits, such as improving our understanding of the astrophysics behind core-collapse supernovae, and improving our understanding of neutron star and black hole populations.	59,108.00	118,241.00	116,341.00	57,208.00	350,898.00
	National Interest Test Statement This project will ensure that Australia plays a leading international science role in the rapidly emerging field of gravitational wave physics, recognised as important in the Australian Astronomy Decadal Plan. The research, which will be undertaken on high performance computers, will substantially enhance our astronomical and technical software capabilities, further promoting Australia's standing as an international leader in high-performance computing. This has application in industry sectors including space science, engineering, medicine, manufacturing and resource management. The findings will also cement Australia's lead in understanding the big questions of astronomy, informing new discoveries that add to the scientific and cultural wealth of the country and providing a return on the Australian government's investment in astronomical science. The astrophysics problems solved in this project will excite and foster an interest in science in all age groups, and help inspire more young Australians to take up careers in science and technology.					
	Swinburne University of Technology	59,108.00	118,241.00	116,341.00	57,208.00	350,898.00

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The University of Melbourne						
DE210100117 Wu, Dr Wenyan	This project aims to address a crucial water resources management problem: how to manage reservoirs under uncertainty. This project expects to develop an optimisation-based framework to improve the delivery of water resources from optimised reservoir operational strategies. Expected outcomes include an innovative tool for multiobjective decision-making under uncertainty, and robust operational strategies catering for real-world operational situations, including conflicting objectives, natural variability in system inputs, and future uncertainty due to climate change and population growth. The improved decisions will protect lives and assets, and postpone expensive infrastructure upgrades by maximising benefits from current systems. **National Interest Test Statement** This project contributes to Australia's Science and Research Priorities in "Soil and Water" by developing an optimisation framework to support reservoir operations. Reservoirs are one of the most important infrastructure in managing our valuable water resources. The proposed framework enables reservoir operational strategies to be developed considering real-world operational context. The project will provide significant social, economic and environmental benefits to Australia from 1) reduced flood risk; 2) increased productivity of our limited water resources for human consumption and the environment; and 3) postponed expensive infrastructure upgrades from optimised use of current system capacity. This project will improve Australia's resilience to future challenges due to climate change and population growth.	71,412.50	144,875.00	142,393.50	68,931.00	427,612.00
DE210100271 Chen, Dr Qinglin	Challenges to food security under conditions of global climate change are forcing us to increase crop production to feed the growing population. Focusing on the plant–microbe interactions, represent a promising area in the search for tools to address this challenge. This project aims to develop a three-step- framework that allows researchers to systematically and reproducibly investigate crop microbiomes to enable us to design a 'Beneficial Biome', a biologically based solution for improving agricultural productivity and environmental sustainability under constrained conditions, where limited resources are available to fertilize. **National Interest Test Statement** Biotic and abiotic stresses cause declines in crop productivity, which significantly compromise global food security. Chemical fertilizers do not provide a sustainable way to alleviate these stresses and could even be ineffective or unavailable in some areas. The crop microbiome as the second genome of the plant, can influence host phenotypes such as growth and tolerance to pathogens, pests, and environmental stresses. This project aims to develop a framework based on available techniques including culture-dependent and culture-independent microbiology approaches coupled with single cell sorting technology, to systematically exploring the crop microbiome and its interaction with the host's fitness. In doing so, the outcome of this project will provide a biologically based approach to boost crop production sustainably and offer opportunities to reduce fertilizer use and increase economic benefits for Australian farmers.	74,462.50	149,050.00	151,540.00	76,952.50	452,005.00
DE210100330 Morris, Dr Rebecca L	Living shorelines are a potentially powerful solution to two pervasive problems: an increased need for coastal protection; and the restoration of lost habitats. This project aims to investigate the effective application of living shorelines using shellfish reefs. It expects to generate new knowledge to ensure living shorelines achieve both hazard risk reduction and habitat restoration goals. Expected outcomes of this project include an enhanced capacity within Australia for the application of nature-based coastal defence, and a better understanding of effective living shoreline design. This should provide significant socio-economic and environmental benefits through the development of a sustainable and adaptive method of coastal defence. **National Interest Test Statement** This research will improve Australia's capacity to adapt to an increase in coastal hazard risk caused by climate change and coastal urbanisation. Half of the Australian coastline (> 30,000 km) is vulnerable to erosion from sea level rise alone, jeopardising more than $226 billion worth of infrastructure. Diverse and sustainable solutions are needed to protect coastlines at this scale. This project will lead the way nationally in developing living shoreline tools for coastal management to provide the following benefits: (1) more economical construction and maintenance costs of coastal defences; (2) preservation and restoration of natural ecosystems; and (3) maintenance of natural land-sea boundaries that connects the community to the ocean. Investment in this project will help Australia become a key player in solutions-focused research for climate adaptation in response to coastal hazards and move forward from the hard structures that continue to dominate Australia's coastal management practices.	76,793.50	153,527.00	153,856.00	77,122.50	461,299.00

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DE210100446 Cox, Dr Peter J	This project aims to address one of the key fundamental questions in physics: what is dark matter? Dark matter makes up 84% of the matter in the universe, but we do not know its identity. This project expects to improve our understanding of the fundamental properties of dark matter and how it interacts with ordinary matter. Expected outcomes include new theoretical models of dark matter that will guide future experiments, and precision calculations of interactions between dark and ordinary matter that are needed to interpret experimental results. Benefits include enhancing Australian research capacity in an internationally active area of research and advanced student training. **National Interest Test Statement** This project aims to increase our understanding of the universe by generating new fundamental scientific knowledge about the composition of dark matter, which has an important role in the evolution of the universe. Findings from this exploratory study will contribute to the national interest through potential downstream applications in the development of instrumentation and detection devices for high precision engineering and advanced manufacturing. These are critical to driving industry and economic innovation in Australia. Additionally, the project will bring national benefits though harnessing widespread curiosity in understanding the universe to engage school students though integrated outreach and education programs that aim to enhance participation in STEM subjects, with a longer view to build future technological capability in the Australian workforce.	73,412.00	146,732.00	149,432.00	76,112.00	445,688.00
DE210100479 Wasko, Dr Conrad	The total costs of natural disasters in Australia are forecast to more than double in the next 20 years - with floods one of the costliest natural disasters faced. The damage and cost of floods can be managed, but rapid developments in the understanding of rainfall and flood projections has resulted in national flood guidelines that are not consistent with current science. This project proposes a novel but practical technique for design flood estimation that will accommodate the key changes to flood behaviour that are expected in the future. This will include consideration of changes in extreme rainfall intensities, catchment wetness, and patterns of storm behaviour. **National Interest Test Statement** The Australian Business Roundtable for Disaster Resilience and Safer Communities consisting of the Australian Red Cross, IAG, Westpac, Munich Re, Optus, and Investa recommend embedding resilience across all aspects of policy and decision-making by “prevention and preparedness through data collection and provision, infrastructure and land use planning, building codes and community initiatives”. This proposal represents a world first attempt to develop methodologies for infrastructure design in the face of changed flooding due to increased extreme rainfall intensities and changed antecedent conditions. By allowing the cost of future flooding to be managed through appropriate infrastructure design this proposal represents significant economic benefit. The proposed approach would be tested through the development of state-of-the-art data sets for flood engineering giving confidence to the outcomes derived.	70,492.50	141,455.00	141,925.00	70,962.50	424,835.00
DE210100492 Runting, Dr Rebecca K	This project aims to design approaches for financial incentive programs that are robust to uncertainties in global climate and economic change, while delivering multiple ecosystem services. Despite billions of dollars allocated to landholders, these schemes have not been evaluated under a range of potential futures. This project expects to incorporate an unprecedented range of uncertainties into incentive program design, and test program performance using spatial simulations of Australia’s dynamic savanna rangelands. This should lay the groundwork for applications to other environments facing similarly uncertain futures, and may prove vital to ensure we can adapt and thrive in a changing climate **National Interest Test Statement** This project focuses on the development of robust strategies for sustainable land management, with direct environmental and economic benefits to the Australian community. In the context of global climatic and economic changes, accounting for uncertainty in the design of financial incentive schemes can deliver broadscale land management that provides multiple ecosystem services with a relatively low risk of failure across all future scenarios. Developing methods for robust financial incentive schemes can have major real-world impacts across extensive privately held lands. Improving the spatial allocation of payments will be valuable for land management funds in Australia, such as the $2.55 billion Emissions Reduction Fund, or Queensland’s recently announced $500 million Land Restoration Fund. In northern Australia in particular, vast areas of extensively grazed savannas have relatively low levels of livestock production, so the opportunity to diversify income streams through participation in incentive schemes may prove vital in a changing climate.	77,120.50	154,260.50	154,239.50	77,099.50	462,720.00

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DE210100705 Gherardin, Dr Nicholas A	The immune system surveys our body examining molecules that signal whether or not everything is ok. T cells are a central to this and use their receptors to monitor these molecular signals. A specialised subset of T cells known as gamma-delta T cells are critical to detecting infection and cancer, yet their fundamental biology is poorly understood. This project aims to unravel this elusive biology. The aims are to understand 1. The diversity in function between gamma-delta T cell subsets, and 2. The diversity in gamma-delta T cell receptors and the molecules that these receptors detect. This work is essential for understanding gamma-delta T cell immunology which is critical if we ultimately wish to harness this to improve human health. **National Interest Test Statement** This project contributes to Australia's national interest by creating important new knowledge informing our understanding of a specialised component of the immune system known as gd T lymphocytes. These cells survey tissues for evidence of infection, cancer or damage leading to an appropriate immune response. The research will determine how these functions are achieved at a molecular level, resulting in high impact publications, novel intellectual property and potential downstream applications. The work will leverage collaborative relationships with Australian and International industry partners, including CSL. The research findings are likely to generate commercial opportunities with these and other potential industry partners.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00
DE210100740 Rudolph, Dr Sophie R	This project aims to examine the history and socio-political context of the school element of the 'school-to-prison pipeline' in Victoria through an examination of school discipline. This project expects to build vital knowledge of the relationship between school discipline and racialised school exclusion through historical accounts, policy analysis, interviews and focus group research. Expected outcomes include new understanding of the social, historical and political effects of school discipline and new possibilities for strengthening school-community relations. This should provide significant benefits, such as improved opportunities for school participation, and enhanced local and international networks to address education equity. **National Interest Test Statement** This project is expected to benefit Australia socially, culturally and economically. Through addressing the pressing and highly publicised issue of youth crime by turning to the historical and social roots of the 'school-to-prison pipeline' this project will contribute to stronger social and cultural school communities in Victoria through generating strategies for greater school connectedness. It will contribute to cultural understandings of the relationship between school discipline and racialised school exclusion, both past and present. In focusing on root concerns and early intervention strategies that develop stronger supportive educational communities it is expected that the project will contribute economic benefits through a reduction in youth involvement in the criminal justice system and greater social cohesion, particularly in communities considered disadvantaged through a range of measures.	63,142.50	136,815.50	144,042.50	70,369.50	414,370.00
DE210100800 Blake, Dr Khandis R	The rise of social media has seen a dramatic increase in self-objectification, a phenomenon where people derive their primary worth from physical attractiveness. Self-objectification has reached almost epidemic levels in Australia and has widespread negative implications for mental wellbeing and physical health, yet the reasons for its recent growth are unresolved. To better understand the conditions driving self-objectification, this project investigates the link between self-objectification, economic inequality, and status anxiety. Understanding the socioeconomic causes of self-objectification may provide needed insight into why it is rising among women and men, as well as targeted policy interventions to lessen its burden. **National Interest Test Statement** There is great and urgent need in Australia for insights into the causes and consequences of appearance-oriented psychology. Australians currently have more cosmetic surgery operations per capita than any other country worldwide, and eating disorders cost our economy $69.7 billion annually (an amount that surpasses the economic burden of depression). By investigating socioeconomic and motivational influences on self-objectification, this project may provide insight into novel drivers of psychological disorders related to appearance. By potentially improving physical and mental wellbeing, this knowledge may support the objectives laid out in the Australian Government National Women's and Men's Health Strategies for 2020-2030, ultimately facilitating higher productivity and economic growth. The project also demonstrates the usefulness of using big social media data to understand how the socioeconomic environment affects fundamental psychological motivations and behaviours in Australia and cross-culturally.	75,000.00	150,000.00	149,000.00	74,000.00	448,000.00

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DE210100872 Miao , Dr Julie Tian	This project examines the role of planning in future-proofing Australia's economic growth. It focuses on innovation infrastructure, that is, facilities integrating hardware, software and cultural support in one place to support innovation activities. This project aims to better attune research, policy and practice to guide effective innovation infrastructure planning by comparing Melbourne, Boston and Shanghai. It responds to the urgent need for Australia to transit towards an innovation-based, economically robust, socially coherent and environmentally sustainable growth model. The project will provide evidence to support: informed public investment decisions; enhanced economic base; and sustained social and economic progress for citizens. **National Interest Test Statement** Significant long-term economic, environmental and social benefits can be gained for Australian communities if innovation can complement mining to become a pillar of Australia's economic growth now. This project intends to generate new knowledge on the best planning practice in supporting innovation through key innovation infrastructure, and ensure lessons learned through comparing cases from Melbourne, Boston and Shanghai are well adapted for the Australian context and widely applicable to other cities and states. One main expected outcome of this project includes an effective planning framework for practitioners and policymakers that integrates robust policy-making logic, evaluation arrangements and applicability to diverse contexts in future-proofing Australia's growth. This would significantly benefit Australia by informing investment decisions, strengthening companies' innovation competitiveness, enhancing citizen well-being, supporting the development of resilient urban infrastructure, green industries and natural disaster prevention and mitigation technologies.	66,663.50	132,321.50	132,316.00	66,658.00	397,959.00
DE210100908 Watts-Fawkes, Dr Stephanie J	This project aims to determine the effects of beneficial soil fungi on wheat and rice grain quality for human nutrition using an innovative combination of physiological, molecular and agronomic techniques. The project expects to generate fundamental knowledge in sustainable agriculture, to improve grain quality and value. Expected outcomes of this project include enhanced understanding of the mechanisms underlying improved grain quality, and the capacity to use soil fungi to increase grain micronutrient concentrations and bioavailability. This should provide significant environmental and societal benefits, such as promotion of the sustainable use of agricultural soils and more nutritious grain products for human consumption. **National Interest Test Statement** This project will provide benefits to the Australian environment through improved knowledge and promotion of sustainable agricultural management practices that lead to improved grain quality, including sustainable soil use. This research will also aid in future-proofing Australia by protecting soil, crop, and human health in a changing climate. The outcomes of the project will make a contribution to the Australian economy by generating knowledge that will lead to the improvement of the value of Australia's grain through increased grain quality and also promotion of cost-effective practices. The resulting improvement in food quality as increased zinc and iron bioavailability from the outcomes of this project will also contribute societal benefits by reducing the prevalence of deficiencies of these important nutrients in the human diet, especially in plant-based diets. This project will also put Australia at the forefront of knowledge in tackling the serious issue of human micronutrient deficiencies ("hidden hunger") that affects a large proportion of humans in developing countries.	76,962.50	153,975.00	153,945.00	76,932.50	461,815.00
DE210101063 Wawegama, Dr Nadeeka K	This project aims to determine the virulence factors responsible for cellular invasion and systemic spread of Mycoplasma bovis, and use genome editing technologies (CRISPR-Cas9) to create gene knock out mutants that cannot invade host cells and test their potential as vaccine candidates in animals. Mycoplasma bovis is an emerging cause of mastitis, the most important infectious disease in the dairy industry, and causes significant economic losses. The vaccine candidates developed in this project are expected to be used to control outbreaks of mastitis, and to improve biosecurity, production and animal welfare in the Australian and global dairy industries. **National Interest Test Statement** Mastitis is the biggest problem in dairy industry, costing the global dairy industry $26-42 billion per annum. Studies have shown that at least 50% of Australian dairy herds have significant levels of subclinical mastitis and this problem costs the industry over $60 million/year. The outcomes of this project will enhance our understanding of cellular invasion and systemic dissemination and unlock new insights into the host-pathogen interactions of Mycoplasma bovis, a pathogen responsible for outbreaks of mastitis throughout the world in the past 20 years including in Australia. The gene knock-out mutants developed in this project will be vaccine candidates that could be used to enhance control of outbreaks of mastitis caused by the pathogen. Better control of this disease will have a direct and positive impact on the economy, biosecurity, production and animal health and welfare in the Australian and global dairy industries and will assist in reducing use of antibiotics in agriculture.	77,158.00	154,316.00	154,316.00	77,158.00	462,948.00

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DE210101091 Thongtanunam, Dr Patanamon	This DECRA project aims to create advanced techniques that will enable software engineers to effectively assure the highest quality of software systems with minimal cost through data-driven recommendations. The current standard practices in software quality assurance involve the manual and tedious process of code review, which can lead to high costs and cause severe delays in software development. The expected outcomes of this project include new theories, techniques, and an automated system that provides insightful feedback, suitable reviewer recommendations, and fine-grained effort prioritisation. Significant benefits are expected to improve the production of Australia's software and the quality of safety-critical software systems. **National Interest Test Statement** Australia’s production of Information and Communication Technology (ICT) goods and services are competitive on a global scale with a total value of 3.78 billion dollars in 2017-2018. However, inefficient software development and quality assurance can lead to significant cost overruns which are estimated to cause a global GDP loss of 300 billion dollars annually. This project will benefit Australia by addressing one of the critical challenges facing the software industry. The first key contribution of this project is to mitigate the inefficiency that occurs during the code review process, expecting to reduce at least 10% of software development time. The second key contribution is to effectively assure the quality of safety-critical software systems that our society relies upon. Our society and well-being rely heavily on innovative technologies run by software systems, and deploying poor-quality software systems could lead to significant financial losses or even serious harm to human life. Hence, this project will benefit Australia by developing technologies to cost-effectively assure software quality.	65,962.50	135,117.50	135,117.50	65,962.50	402,160.00
DE210101093 Wood, Dr Alexander A	This project aims to use physical rotation of diamonds on timescales faster than quantum decoherence to set new detection limits for precision quantum sensing of electric and magnetic fields. This potentially allows us to see for the first time how the Coriolis force acts on current flowing in a frame rotating 700,000,000 times faster than the earth. The project's expected outcomes are electro-magnetic sensors with unprecedented sensitivity that could find application in areas ranging from detecting household wiring to locating magnetic anomalies for defence. These outcomes should fill a blind spot of quantum magnetometry, have commercial impact and expand our knowledge of quantum physics in the rotating frame. **National Interest Test Statement** This project will use extremely rapid physical rotation to significantly improve the sensitivity of electric and magnetic field detectors. Realisation of the aims of this project will reinforce Australia's position as a leader in quantum science and novel applications of quantum technology, ensuring the Australian community is at the forefront of quantum research when economically-transformative technology leaves the lab and enters the commercial domain. Sensing magnetic fields is of prime importance in a number of fields, including defence, where it underpins detection of magnetic anomalies such as submarines. Other applications include exploring the role of of electric charges and currents in living systems. This project will develop rotationally-enhanced quantum detectors with real prospects for impactful commercial application. This project will deploy these new sensors to explore the fundamental properties of charge transport, furthering our understanding of electromagnetic phenomena and enhancing Australia's reputation in novel quantum science and technology.	71,970.50	144,729.50	147,823.00	75,064.00	439,587.00
DE210101129 Bullock, Dr James B	The aim of this project is to leverage the fundamental advantages that two-dimensional (2D) materials could provide to vertically-stacked (tandem) photodetectors. The strong absorption, tunable bandgap and polarisation dependence that many 2D materials exhibit, provides a means by which to detect properties of light. This topic is significant because it could overcome current cost/performance issues of tandem detectors, enabling widespread usage. The expected project outcome is the development of a novel tandem 2D detector, which as a single detector/pixel, can extract the intensity, polarisation and wavelength region of incoming light. This would provide benefits for many future applications, including machine vision and aerial surveying. **National Interest Test Statement** A single photodetector, capable of providing intensity, polarisation and spectral information, has far-reaching benefits of relevance to Australia. For example, this detector could be integrated as a pixel within a camera leading to improved object detection in autonomous vehicles and other machine vision applications; higher resolution aerial monitoring of vegetation and soil condition for agricultural and environmental management; and greater accuracy and customisability in ultraviolet, visible and near-infrared medical imaging. More generally, the development of expertise in novel vertically-stacked photodetectors could fuel an Australian-led, high-tech sector. This could introduce further economic and job creation benefits to Australia.	72,658.00	142,816.00	140,316.00	70,158.00	425,948.00

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DE210101264 Garbali, Dr Alexandr	Modelling systems of quantum and classical mechanics usually relies on computationally expensive numerical methods. Such methods typically provide raw answers and give little insight. In contrast, a special class of modelling based on quantum integrability provides us with a variety of analytic tools thanks to connections with algebra, geometry and combinatorics. The project aims to study quantum integrability with the help of new exciting developments in toroidal quantum groups. The anticipated outcomes include constructions of new models, developing analytic methods and computer algebra packages. These results are expected to facilitate challenging computational problems in modelling of quantum and classical systems.	57,632.00	113,555.00	113,541.00	57,618.00	342,346.00
	National Interest Test Statement Modelling can help in understanding a range of natural phenomena, from behaviour of electrons in materials to spread of disease and fires. This project contributes to Australia's national interest through its potential to deliver improved modelling based on access to new analytic and numerical tools which will enable better, more accurate predictions. Findings from the research will lay the foundation for developing novel applications such as smart computerised solutions to problems of natural phenomena, engineering and environmental, with potential for significant social and economic benefits. The project investigates a key challenge for the international mathematical physics community, and knowledge generated by it will enhance Australia's strong reputation and capability in pure and applied sciences. This is vital for strengthening workforce capacity, attracting highly qualified researchers and engineers and establishing new and stronger collaboration with scientific institutions in Australia and internationally.					
DE210101323 Dartois, Dr Stephane	This project aims at improving knowledge on probabilistic objects having applications in, for instance, mathematical-physics, statistical physics, quantum gravity and data science. In doing so, we expect to produce new mathematical results by building upon both classical approaches and innovative ones. In particular, on one hand, the extension of classical graphical methods will be developed and, on another hand, generalized probability theories will be used to provide new insights. The expected outcomes include a better understanding of the generic properties of quantum states. This should significantly benefit to mathematicians and physicists whose models use those objects and may impact the broader community of engineers and technicians.	55,653.00	115,146.00	117,071.00	57,578.00	345,448.00
	National Interest Test Statement Recent years have seen a growing interest in random tensors and random matrices with complicated substructures. This is due to the numerous applications of such random objects to theoretical and practical aspects of many fields. A non-exhaustive list of these fields includes for instance telecommunications engineering, theoretical aspects of artificial intelligence, statistical analysis of large data sets, quantum information theory, many-body physics, quantum black holes physics and enumerative geometry. Some of those fields can have impact on technological applications while some other relate to the most difficult problems in mathematics and physics. Hence, this project is expected to have a cultural impact on the Australian community by creating new mathematical knowledge which has potential applications in many fields important for Australia's economy.					
DE210101352 Geng, Dr Xi	The signature transform provides an effective summary of the essential information encoded in multidimensional paths that are highly oscillatory and involve complicated randomness. The main goal of this project is to develop new algorithmic methods to reconstruct rough paths and random processes from the signature transform at various quantitative levels. This project expects to make theoretical breakthrough on the significant open problem of signature inversion, thereby advancing knowledge in the areas of rough path theory and stochastic analysis. The newly developed methods will be utilised in combination with the emerging signature-based approach to study important problems in financial data analysis and visual speech recognition.	55,000.00	111,000.00	110,000.00	54,000.00	330,000.00
	National Interest Test Statement Many types of data streams and random processes arising from scientific modelling are multidimensional paths that are highly oscillatory and irregular, best analysed through application of mathematical transforms. Simple examples include studying the frequency and amplitude of ocean waves, stock-market fluctuations and epidemics. This project aims to develop quantitative and numerical analysis techniques and extend these to high-dimensional problems, analysing rough paths and random processes through a fundamental type of mathematical transformation. While foundational in its aims, the theoretical results produced in the project can potentially be applied to a wide range of problems in data science that involve the analysis of time-series data arising from complex dynamical systems. These advances may ultimately underpin improved forecasts of system behaviour with potential long-term benefits throughout the Australian scientific and financial industries.					

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DE210101396 Kidanemariam, Dr Aman Ghebremichael	Microplastics have become ubiquitous in our rivers, lakes and reservoirs, detrimentally impacting ecosystems. Via high-fidelity numerical simulations, the project aims to advance our understanding of the complex interplay between dispersed microplastics and key fluvial processes including turbulence, sediment transport and free-surface wave dynamics. The project intends to buildup a data-base containing high-resolution data of the occurrence, trajectories and distribution of microplastics. The outcome is anticipated to be invaluable in improving microplastic transport models, standardisation of sampling and quantification techniques, and in designing innovative mitigation technologies for microplastic collection. **National Interest Test Statement** Out of the 3 million tonnes of plastic that Australia produces each year, only 12% is recycled. About 130 thousand tonnes of the rest ultimately ends up in our water bodies causing detrimental impact upon our aquatic ecosystems. The outcome of the project is expected to be instrumental in advancing our understanding and prediction capabilities of the fate and transport of microplastics. The project is expected to play central role in gauging the environmental risk posed by microplastics and in designing and probing of sustainable environmental solutions as well as elevating societal awareness of the significance of plastic pollution. This will be essential for the protection and rehabilitation of polluted water sources in Australia which is home to unique wildlife.	68,179.50	139,142.00	142,425.00	71,462.50	421,209.00
DE210101497 Zhu, Dr Jingge	Interference occurs when a device involuntarily receives signals from unintended transmitters. Interference is the biggest challenge in modern large-scale communication networks. In contrast to conventional wisdom that avoids interference, this project aims to harness interference for its advantage. It will view interference as a form of computation that can be exploited advantageously using structured codes. Developing theory and novel coding techniques, this project expects to deepen our understanding of interference, and significantly increase the network bandwidth efficiency. Expected outcomes will benefit a wide range of applications such as next-generation mobile systems, sensor networks, and cyber-physical systems. **National Interest Test Statement** The outcomes of this project will provide a paradigm shift in our understanding and response to interference in large-scale communication networks. In addition to illuminating long-standing open problems in the fields of communication and information theory, these novel coding techniques and decoding algorithms will have a significant impact on a wide range of practical applications. They can be applied to next-generation cellular systems, sensor networks, secret communication systems and cyber-physical systems. As a networked society, the benefits to Australia from this research cannot be overstated. Large scale communication networks are already integral in our modern world and their importance is continually growing. More active devices are joining ever-expanding communication networks. Thus, the benefits of increasing bandwidth efficiency in these networks are huge and will improve our finances, society, health, safety and environment.	69,627.50	140,095.00	144,100.00	73,632.50	427,455.00
DE210101581 Ipsen, Dr Jesper R	Complexity is a rule of nature: large ecosystems, the human brain, and turbulent fluids are merely a few examples of complex systems. This project aims to study and classify criteria of stability in large complex systems based on universal probabilistic models. This project expects to generate new important understanding of stability using cutting-edge techniques from random matrix theory. Expected outcomes of this project include development and expansion of an innovative mathematical framework and techniques which allow a unified and universal approach to the question of stability in large complex systems. **National Interest Test Statement** From analyses of the macro-economy, to climate change, ecological food-webs and fundamental problems in physics, studying the behaviour of large complex systems requires an ability to analyse the solutions of high-dimensional mathematical models. Random Matrix Theory is a foundational component of the analysis toolkit and a rich mathematical area in its own right, receiving much attention from the international research community. This project will contribute to Australia's national interest by strengthening Australian involvement in this prominent and rapidly growing domain of mathematical physics and applied mathematics. Furthermore, the project will include a higher degree research student who will benefit from working in a cutting-edge research area and from connections to the European research community. The research of this project is fundamental in nature, but it has potential applications across a wide range of enterprises, including business, economic and financial analysis and the physical and biological sciences.	69,000.00	138,000.00	136,500.00	67,500.00	411,000.00

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DE210101624 Gong, Dr Mingming	This Project aims to enable machines to discover causal relations from various kinds of unstructured data, such as images, text files, and sensor data. The project expects to promote causal revolution of data-centric intelligence and science – construct machines that can communicate in the language of cause and effect and answer 'why' questions by inferring from unstructured data. Expected outcomes of this project include theoretical foundations for causal discovery from unstructured data and practical algorithms that drive intelligent machines to make rational decisions in real-world scenarios. This should benefit society and the economy nationally and internationally through the applications of artificial intelligence and data science. **National Interest Test Statement** Artificial intelligence is changing the way we live and work. This project aims to construct machines that can communicate in the language of cause and effect, that is, to answer 'why' questions by inferring from unstructured data, such as images, text files and sensor data. The capacity to perform this causal reasoning will advance the intelligence level of machines and extend their impact, bringing benefits to many areas such as health, scientific research, industry and communication. Project outcomes will align with Australian national research priorities for improved prediction, identification, tracking, prevention and management of emerging local and regional health threats. The study will also produce innovative technology with potential significant impacts on industry and the economy, specifically market prediction, internet site selection and advertising. Finally, new knowledge generated on theoretical and computational aspects of causal discovery in machines will strengthen Australia's profile as an international research hub on artificial intelligence.	68,462.50	136,925.00	136,925.00	68,462.50	410,775.00
DE210101627 Macreadie, Dr Lauren	This project aims to improve the adsorption properties of porous materials through enhancing their selectivity and also creating new composites. This research expects to extend application opportunities to encompass real-life scenarios, in particular hydrogen transfer and carbon capture. Expected outcomes is the enhancement of the adsorbent properties of these porous materials, and an improvement of their selectivity and mechanical robustness. This is due to the synergistic strengthening effects of new graphene and nanodiamond composites. The benefit of this research is in bridging the gap between porous material synthesis and industrial application, contributing to Australia's becoming a world leader in clean energy research. **National Interest Test Statement** The outcomes of this project will form porous composite materials, generating an exciting platform for future high performance materials for hydrogen storage and delivery, carbon capture and nanotechnology medicinal usages. Here, this research helps bridge the gap between an exciting area of porous materials chemistry, originally developed in Australia, and direct industrial applicability. This project will foster important future collaborations in this sector and emphasise Australia's competitiveness and dedication to delivering a low carbon energy economy and a movement towards hydrogen fuel cell vehicles. Additional benefits will encompass the realisation of new applications of these composite materials, such as nanoparticle drug delivery.	74,637.50	149,200.00	149,175.00	74,612.50	447,625.00
DE210101804 Brown, Dr Reuben J	This project aims to investigate how ceremonial performance at Indigenous festivals in northern Australia enacts diplomacy between Indigenous and non-Indigenous participants, and between different clan and language groups. The project focuses on festivals in the Top End, 1964-present, using collaborative research with ceremony leaders and a comparative analysis of performance. The project expects to generate knowledge on how the exchange of dance and song in festivals is linked to ceremonies of diplomacy, and how this diplomacy enables intercultural dialogue. Expected outcomes include a mobile song library of archival recordings. Expected benefits include strengthened community efforts to sustain Indigenous song traditions into the future. **National Interest Test Statement** Language, song, dance and story are vital to the wellbeing of Indigenous Australians, yet Indigenous perspectives on how to keep culture strong are understudied. Indigenous festivals foster local expressions of culture and contribute to the livelihoods of present and future economies. However, we know little from practitioners themselves about how songs and dances in multiple languages are staged and exchanged. This time-critical project will produce new knowledge about the ways in which Indigenous and non-Indigenous diplomacy and wellbeing are enacted through public ceremony in contemporary festivals. The project combines interviews with ceremony leaders about situated Indigenous knowledge, archival research and analysis of ceremonial performance. Project outcomes will contribute to cross-cultural respect and a deeper understanding of place within the broader community. The creation of a mobile song library will provide new models for intergenerational learning for apprentice singers and dancers and improve access to and links between datasets, archives and Indigenous communities.	71,623.00	144,902.50	147,732.00	74,452.50	438,710.00
	The University of Melbourne	1,680,184.00	3,382,272.00	3,402,047.00	1,699,959.00	10,164,462.00

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Victoria University						
DE210101107 Stavropoulos, Dr Vasileios S	This project battles the risks and embraces the benefits of digital gaming. There is a risk that one loses control of their gaming and prioritises it over other duties. This is offset by the benefits of using digital games for health. It is the first to decode and use the health data embedded in the connection between the gamer and their game persona (avatar). It does this by concurrently assessing important gamer, family, cultural and game structure features. Findings will prompt the ethical growth of the Australian Health games industry and inform strategies to combat gaming disorder by tailoring games to users' needs. This will uniquely benefit Australians by re-directing this growing industry to better serve the public interest. **National Interest Test Statement** The digital gaming field is a growing economic market for Australia and shows no signs of slowing down. It had a 25% rise, to a total of $4.029 billion in expenditure in 2018 with an estimated 70% of Australians gaming in some form/frequency. Local game production is a growing export industry, with $143.5 million in revenue and 1,275 full-time jobs (IGEA 2019). Moderate gaming has significant benefits, such as increased well-being and cognitive skills. These inform the development of games for health. Excessive gaming though is detrimental for mainly younger users, who experience depression, anxiety and productivity loss, raising public concerns. There is a need to develop national strategies to balance gaming benefits and risks with markets and public interest. Decoding the health information carried in the connection between the gamer and their in-game persona is a unique opportunity in that direction. Such knowledge will improve the health of Australians, whilst contributing to the expansion of the local game production industry into the “health-gaming” market segment (valued at 40 billion USD).	68,500.00	137,000.00	137,872.00	69,372.00	412,744.00
	Victoria University	68,500.00	137,000.00	137,872.00	69,372.00	412,744.00
	Victoria	3,835,637.00	7,719,944.00	7,709,263.50	3,824,956.50	23,089,801.00

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Western Australia						
Curtin University						
DE210100986 Zhang, Dr Xihong	This project aims to develop a next-generation building system integrated with robotic construction, using intelligent interlocking block units with hazard resistance, and sustainable engineered recycled plastic waste materials. It spans from discovery of using recycled waste materials to development of analysis and design methods for a new interlocking structure, as well as mitigation measures for blast resistance. The successful implementation of this project will result in a technically, financially and environmentally sound structure form for the next-generation of robotic construction. This should lead to a revolution in construction that will substantially improve construction efficiency, quality and affordability.	70,962.50	139,425.00	141,925.00	73,462.50	425,775.00
	National Interest Test Statement Successful completion of this project will lead to the development of a next-generation building system with hazard resistance and sustainability gains for Australia and globally. It seeks to develop an innovative form of structure that is technically sound, financially practical and environmentally friendly. Using this in Artificial Intelligence-based robotic construction is expected to revolutionise construction efficiency, quality and safety. The development of new brick mixtures utilising recycled plastic waste materials should provide both short-term and long-term strategic solutions to the urgent plastic waste problem in Australia, by consuming waste in construction materials. The discovery of new engineering meta-materials using melted plastic and iron ore residuals is an innovative proposal which bridges the gap between frontier science and engineering practice. The developed knowledge and products will enable Australia to lead in the forthcoming competition in next-generation building and associated manufacturing, addressing the Science and Research Priority of Advanced Manufacturing.					
	Curtin University	70,962.50	139,425.00	141,925.00	73,462.50	425,775.00
The University of Western Australia						
DE210100398 Bayer, Dr Philipp E	My recent work has demonstrated that in contrast to animal genes, many plant genes show presence/absence variation within a species, with associated trait variation. In this project, I will explore models of gene birth and death by comparing genomes of Brassicaceae, including the model Arabidopsis and Brassica crop species. By comparing many genomes I will learn how new genes were born. I will build models that predict the likelihood of gene loss based on a gene's physical environment, function, and expression. The project will build on our understanding of plant genetic diversity. Expected outcomes of this research include the identification of key genomic elements in gene birth and loss and support strategies to improve plant cultivars.	76,963.50	151,370.50	147,219.00	72,812.00	448,365.00
	National Interest Test Statement This project investigates mechanisms and causes of plant gene gain ('birth') and loss ('death'). The aim is to find the mechanisms behind how novel genes arise in plant genomes, and how potentially important genes are lost from plant genomes. The knowledge gained will be translated into practical applications in applied crop improvement. By learning how genes are born we can learn how to create new genes with new functions useful to farmers and breeders. Vice-versa, by learning how genes are lost we can learn how to protect genes of agricultural importance from being lost. The models and technologies developed in this project will enable more rapid and effective development of new crop varieties that are optimal for Australian conditions. This will benefit the Australian economy by providing farmers with improved crop varieties which can produce yield under an increasingly variable climate, resulting in increased food exports. This also ensures food security for Australian consumers. This project aligns with the Australian Government's National Science and Research Priority 'Food'.					

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

Minister's Approval for Discovery Early Career Researcher Award for Funding Commencing in 2021 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
DE210100536 Friesem, Dr David E	This project aims to investigate how the first people to arrive in Australia responded and adapted to diverse environments and changing ecosystems. This project will analyse microscopic remains of human activity from eight key sites in Western Australia, dated between 50,000 and 7,000 years ago. This will generate new evidence on the earliest technology, ecology and landscape management, in relation to environmental changes since the last Ice Age. New understandings on the earliest ecological behaviour and adaptations to diverse ecosystems will be generated through international collaboration, with important outcomes for Australian archaeology and advancing Traditional Owners' engagement in this scientific study of their deep-time heritage.	75,999.50	151,398.00	147,181.50	71,783.00	446,362.00
	National Interest Test Statement Recent discoveries continue to provide new evidence for the early peopling of Australia. However, we still know little on how these first peoples in Australia adapted to the diverse environments and ecosystems including extreme environmental changes during and since the last Ice Age. Focusing between 50,000 and 7,000 years ago, this project will examine microscopic and molecular residues from key sites in Western Australia where other lines of evidence have already emerged (such as, the earliest innovative use of certain stone tools, plants, animals and pigment). The project's results are expected to help us understand how early cultures of Australia were shaped by and reacted to environmental changes. The project will advance engagement between Traditional Owners and the scientific study of their deep-time history, resulting in new evidence to create better ways preserve this State's extraordinary Aboriginal heritage.					
DE210101163 Clement, Dr Sarah E	The scale and intensity of bushfires in Australia has reached alarming levels, and this is only expected to get worse in the coming years. This project aims to support a more robust, integrated and resilient approach to fire management, which focuses on the role of governance. Using a new approach to analysing the present and planning for the future, the project brings together multiple stakeholders and perspectives. Key outcomes will include practical options to reform governance and policy and an innovative way of exploring tensions and trade-offs in bushfire management. This should bring significant benefits by improving the ability to anticipate and adapt to change, while addressing risk to communities and ecosystems.	55,983.00	120,091.00	119,991.00	55,883.00	351,948.00
	National Interest Test Statement This project addresses the urgent problem of bushfires in Australia, by bringing together experts and demonstrating the potentially powerful impact that governance reform could have on future fire risk. The impact of bushfires on Australia's communities, environment, and its tourism, agriculture and mining industries is projected to intensify in the future. Past attempts to reduce the risks posed by bushfires have sought changes in policy and practice, which have been controversial or difficult to implement. This has slowed progress in reforming governance, which is not in the nation's interest. This project will focus on the difficult but necessary conditions for making progress in managing bushfire risk. It will develop practical ways to bring stakeholders together, consolidate the science, and identify shared actions to reform governance that consider social, economic, and environmental aspects of this important issue. The benefit for the nation from this will be the capacity to safeguard Australia's economy, its rural communities and its natural environment.					
DE210101791 Trapp (nee Wood), Dr Gina	Bridging the disciplines of nutrition, public health, geography and urban planning, this unique and innovative project strives to be the first in Australia to: (i) longitudinally map, measure and monitor the food environment near schools; and (ii) comprehensively investigate how the proximity of healthy and unhealthy food outlets near schools impacts on children's eating behaviours. The findings will be used to develop a set of policy and practice recommendations for key stakeholders (e.g., school staff, students, parents, community members, retailers, planners and government) to help create equitable and health-promoting food environments near schools.	67,662.50	134,821.00	133,121.00	65,962.50	401,567.00
	National Interest Test Statement This project fits directly within the Australian Government's Science and Research Priorities of "Food" and "Health." It focuses on children (a vulnerable population group), will identify how disparities in healthy and unhealthy food access impacts children's food intake and will produce findings to help support planning decisions and future policy direction to create equitable food environments near schools that foster healthy eating. Appropriate nutritional intake during childhood is vital for overall health and wellbeing, physical, psychological and social development and for academic performance. Furthermore, nutrition habits practiced in childhood often persist into adulthood, thus targeting the nutritional practises of young people is crucial to improve the diet of Australian youth, prevent obesity and influence current and future outcomes. Such improvements could lead to economic benefits to the horticulture industry (via increased fruit and vegetable consumption) and significant reductions in future obesity-related costs to governments (via the health-care system).					
	The University of Western Australia	276,608.50	557,680.50	547,512.50	266,440.50	1,648,242.00

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(Columns 1 and 2)	(Column 3)		2020-21 (Column 4)	2021-22 (Column 5)	2022-23 (Column 6)	2023-24* (Column 7)	(Column 8)
		Western Australia	347,571.00	697,105.50	689,437.50	339,903.00	2,074,017.00
			14,003,111.50	**28,092,190.50**	**28,017,655.00**	**13,928,576.00**	**84,041,533.00**

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