Minister's Approval for Discovery Early Career Researcher Award for Funding Commencing in 2025 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)			Total ($)
		2024-25	2025-26	2026-27	2027-28	
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
Australian Capital Territory						
The Australian National University						
DE250100003	**The Origin of Magnetic Fields in Galaxies**	81,430.50	162,866.50	162,878.50	81,442.50	488,618.00
Seta, Dr Amit	Understanding how stars and galaxies form and evolve requires a thorough knowledge of magnetic fields in galaxies. This project aims to investigate the origin and evolution of galactic magnetic fields by developing self-consistent numerical simulations and utilising state-of-the-art observations from Australia's latest radio telescope, the Australian Square Kilometre Array Pathfinder. Expected outcomes include accurate magnetic field measurements in the Milky Way and nearby Magellanic Clouds and a theoretical understanding of galactic magnetic fields. This will directly benefit cosmological simulations and the next-generation radio telescope, the Square Kilometre Array, and provide training in fundamental physics and complex data analysis.					
	National Interest Test Statement					
	Using data from Australia's newest telescope, the $300 million Australian Square Kilometre Array Pathfinder, this project introduces innovative avenues for research with the upcoming Square Kilometre Array, Australia's first mega-science, multi-national, multi-billion dollar infrastructure program (Australian investment of $387 million in the 2021–22 federal budget). Therefore, the project immediately increases the return on Australia's substantial investment. It addresses two major research questions (#3 'How do galaxies form and evolve across cosmic time?' and #4 'How do stars and planets form?') of the Decadal Plan for Australian Astronomy, contributing to a significant research gap. The compelling scientific plan with a combination of numerical simulations and observations would train our next generation and also lead to an engaging outreach program for school students and the general public, especially by using simulations to create a virtual reality experience of astrophysical processes. The techniques developed to compare images from computer simulations and telescope observations have the potential to be far more influential and can be broadly used, for example, in material science and medical imaging. Furthermore, the production and analysis of large amounts of data from simulations and observations will push the boundaries of our nation's supercomputing and networking infrastructures, putting us in a better position to benefit from the upcoming big data revolution.					
DE250100004	**How environmental change drives the origin and decline of biodiversity**	81,014.00	162,145.00	162,323.50	81,192.50	486,675.00
Skeels, Dr Alexander	This project aims to measure the effects of past environmental change on the emergence of biodiversity in Indo-Australasia. By integrating high-resolution reconstructions of past environments and new simulation models, this project expects to generate new knowledge on the way biodiversity develops in a mega-diverse and climatically dynamic region. Anticipated outcomes include: an open-source historical environmental database, innovative new methods and software tools for the global research community, and a deeper understanding of the responses of organisms to environmental change. Significant benefits include identifying groups of species that have been vulnerable to historical environmental change to help predict future vulnerability.					
	National Interest Test Statement					
	Australia's unique biodiversity is threatened by the widespread effects of environmental change. However, the historical vulnerability of species to past environmental change – a factor that could predict future extinction risk – remains largely unknown. The Australian Government's Science and Research Priorities (2015) highlights the critical importance of improved predictive power of the impacts of environmental change on biodiversity. This project will contribute to reaching this goal by developing cutting-edge methods and leveraging large publicly funded biodiversity datasets for a wide range of animals and plant groups across Australia and its Asia-Pacific neighbours, to provide a comprehensive assessment of the factors shaping species responses to environmental change. By sharing knowledge outcomes and predictive tools with policy makers and conservation managers this project will contribute a new approach to help tackle biodiversity loss in Australia and protect threatened species in the face of ongoing environmental change.					
DE250100071	**Quantifying Australia's long-term risk of rainfall extremes**	75,454.50	156,044.00	143,713.00	63,123.50	438,335.00
Falster, Dr Georgina M	Rainfall extremes, such as droughts and floods, severely impact the Australian economy and society. This project aims to quantify the range of Australian rainfall extremes during past centuries—including long-lasting events beyond recent experience. This will allow accurate assessment of Australia's rainfall risk in the coming decades, by accounting for natural rainfall variability as well as human-caused climate change. Geochemical data and numerical methods developed in this project have applications for water security and biosecurity, and will transform future research into long-term climate risk. This should provide significant benefits for water					

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	resource managers, allowing preparation for rainfall extremes we might face in the future. **National Interest Test Statement** The Australian Business Roundtable for Disaster Resilience and Safer Communities states "We cannot prevent weather events, but that does not make disasters inevitable". To avoid disaster, Australia must be ready for extreme rainfall events, but we cannot prepare if we do not know what sort of events might be coming. For example, the 2017-2019 Tinderbox Drought was beyond anything experienced in the past century, and cost Australia $63 billion. Currently, we do not know what sort of extreme rainfall events to prepare for, because rainfall records are too short for us to have experienced the full range of natural variability. This project will address that knowledge gap: revealing past Australian rainfall trends by combining information from observations, climate models and tree ring data. Together, these sources of information will provide a comprehensive assessment of Australia's rainfall-related climate risk, advancing the National Climate Resilience and Adaptation Strategy by delivering "world class climate science that informs successful adaptation". Water management authorities will be able to use these results to plan for the worst-case extreme rainfall events identified as part of the natural range of variability. Building on my excellent track record of impactful science, findings of the project will be communicated to the Federal government and industry leaders via briefing notes, and to the Australian public through media engagement and popular science articles.					
DE250100149 Balasubramanian, Dr Aditya	**Roads and Road Transport in India: An Environmental and Economic History** This project aims to investigate how roadbuilding and transportation has spurred economic progress and driven environmental change in India. Focused on the 1940s-70s, it aims to conduct three site studies of important roads. The project expects to generate new knowledge on infrastructure creation and its consequences via road ethnography, archival research, and quantitative and qualitative analysis of published sources. Expected outcomes include a new economic-environmental postcolonial history of India and global research collaboration to study Asian infrastructure's history. The anticipated benefit is to expand Australia's understanding of tradeoffs been economic development and environmental change of a major trading partner and ally. **National Interest Test Statement** India is Australia's fifth largest trading partner, a key market for its fossil fuels, and a strategic partner in the Indo-Pacific Quad. Building roads and registering motor vehicles at an unprecedented pace, India is also attempting an ambitious transition to alternative energy sources. India's experiences are instructive for Australia, which confronts similar challenges, albeit on a smaller scale, of reconciling infrastructure development and growing motor vehicle usage alongside transitioning to alternative energy. Combining ethnography on roads, archival research, statistical analysis and extensive readings of industry and government publications, this project will provide an historical examination of road building and transportation in India. It will uncover the drivers of increased energy demand and provide new understandings of the potential environmental impacts for future infrastructure planning. Findings will be shared with policymakers through open access videos of policy-related discussions conducted at a major infrastructure conference and a major open access data series of road and transport statistics. Their use of the findings and data will enable them to guide Australia's future energy planning, and in doing so, balance similar tensions between Australia's future infrastructure development and energy transition.	80,242.00	161,176.00	158,277.50	77,343.50	477,039.00
DE250100406 Chen, Dr Chaohao	**Mid-infrared imaging with visible detectors at room temperature** The project aims to develop a compact device platform for broadband mid-infrared (MIR) imaging by integrating material science, nanotechnology, imaging algorithms, and photonics. This project addresses challenges in low MIR radiation detection efficiency at room temperature by exploiting the lanthanide nanocrystal to convert the MIR radiation into visible light, which is detectable by the standard silicon-based photodetectors. The expected outcomes include advanced energy looping-based MIR detection mechanisms and nano-fabrication techniques, enabling an integrated chip-based laser-free platform for next-generation MIR imaging systems. Anticipated benefits stem from improved sensing, imaging, and communication for various applications. **National Interest Test Statement** The advancement of infrared sensing and imaging technologies that use emerging nanomaterials represents a pivotal breakthrough for Australia, addressing limitations in current commercial infrared cameras, which are based on toxic materials, require cooling, and incur high costs. Aligned with Australia's long-term research strategy, this project focuses on creating novel lanthanide nanocrystals that convert infrared light to visible light, detectable with existing commercially available silicon-based detectors. When incorporated into devices, these nanomaterials provide a universal infrared technological platform with higher detection efficiency and improved imaging resolution. The research aims to substantially reduce the cost of infrared sensors and cameras, thereby increasing accessibility across various sectors. The resulting technology has broad applications in analytical biochemistry, disease diagnostics, environmental sciences, food safety, and agriculture. The technology's compatibility with existing detectors ensures seamless adoption. With an estimated global infrared imagining market of $11.15 billion by 2030, the commercialisation potential of this technology will escalate the Australian surveillance and monitoring companies on the international level.	81,428.50	162,807.00	156,378.50	75,000.00	475,614.00

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DE250100419	**Chiral photonics with resonant meta-structures**	68,612.50	133,661.00	130,097.00	65,048.50	397,419.00
Koshelev, Dr Kirill	The project aims to address the big challenges of miniaturising optical elements controlling light handedness and polarisation that are crucial for high-speed information processing. The project will employ artificially engineered nanostructures, and it expects to generate new fundamental knowledge in photonics to enhance optical chirality beyond the limits available in natural materials through optical resonances and the use of novel materials. Expected outcomes include the development of advanced concepts in optics, novel methods in computational photonics, and practical designs and demonstrations of highly efficient chiral nanostructures. This research promises substantial benefits to optical data processing and telecommunications.					
	National Interest Test Statement					
	In today's information-driven era, an incredible volume of data is generated yearly, escalating the demand for advanced technologies in high-speed data processing. Australia is leading the transition to new technologies with projects like the National Broadband Network, replacing copper-based electron transmission with photon-based optical fibers. Moving towards photon-based technologies involves creative work to make optical components smaller because current optical devices struggle with issues like high power consumption, slow data transfer, and meeting cybersecurity standards. The aim of the project is to develop a next-gen set of tiny photon-related components using nanostructures much smaller than the width of a human hair. These devices can encode information as a binary code of 0s and 1s by transforming the polarisation of light. This project holds immense significance as it could revolutionise data processing, directly impacting crucial sectors for Australia's growth. Economically, the transition promises a competitive edge in technology and cybersecurity, fostering new industries and jobs, with potential applications in optical computers, sensors for disease detection, and mineral location. Socially, it promises nationwide improvements in connectivity. Environmentally, it promotes reducing energy consumption, aligning with sustainability goals. Additionally, the project offers extensive training for future scientists, shaping careers in academia and industry.					
DE250100426	**Unlocking yield gains with a new pathway targeting plant nitrogen usage**	81,263.50	162,570.50	152,538.00	71,231.00	467,603.00
Taleski, Dr Michael M	Nitrogen fertiliser is indispensable for agricultural productivity, but crops are inefficient at utilising fertiliser for grain production. This project aims to decipher the role of a peptide hormone receptor pathway in determining yield by control of seed size, number, and the draw of nitrogen from canopy to seed, across different organs, cell types and plant species. Project findings are expected to provide advanced knowledge on how plants utilise nitrogen for grain filling. The findings may aid and accelerate crop development for production of more grain with less fertiliser, with benefits of improved food security, grain protein quality, nutrition, reduced input costs, and a reduction of unused fertiliser entering the environment.					
	National Interest Test Statement					
	The Australian grains sector is an important contributor to the economy, and to food and feed both locally and internationally through substantial global exports. Nitrogen fertiliser is one of the biggest input costs for Australian grain farmers. However, inefficient crop uptake and usage of fertiliser reduces farm profits and contributes to substantial environmental damage. Developing new plant lines that are more efficient at utilising nitrogen to form grains is critical to agricultural productivity and sustainability in the context of environmental stewardship and meeting global decarbonisation targets. This project aims to provide knowledge of plant genes affecting the delivery of nitrogen to the seed and how these genes may be targeted for rapid crop improvement using modern gene editing technology. Project outputs are expected to be useful for plant breeders in the medium to long term (5–10 years) for the creation of high-yielding crops with lower fertiliser requirements. As a major export crop for Australia (forecasted $2.7b, 2023–24), the project will use barley as a model; however, findings are also expected to be applicable to other key agriculture crops. Results will be communicated directly to industry through existing networks. Outcomes are expected to build capacities in the application of emerging gene technologies to help secure the long-term competitiveness, productivity, and environmental sustainability of Australian grain production.					
DE250100542	**Worlds Unseen: Inferring Hidden Structure with Generative Vision Models**	78,738.50	157,477.00	157,477.00	78,738.50	472,431.00
Campbell, Dr Dylan J	When observing the 3D world, the unseen part can only be surmised from experience. This project aims to infer the hidden structure of the 3D world by learning from generative computer vision models trained on large image datasets. This will facilitate the reconstruction of realistic and complete 3D models from images. It will generate new knowledge in computer vision using innovative techniques from differential geometry. Expected outcomes include open-source software for intelligent agents, such as robots, that better understand the 3D world in order to perform more useful tasks. Significant benefits to the manufacturing, aged care and transportation sectors are expected, with applications in robotics, smart homes and autonomous vehicles.					
	National Interest Test Statement					

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	Australia faces the national challenges of reviving its manufacturing base, improving the health outcomes of its ageing population and reducing emissions across all sectors. It is important to address these challenges to retain strategic capability, to ensure a resilient economy and to build an equitable and healthy society. Combining cheap and ubiquitous sensors with sophisticated processing, computer vision can contribute to solving these challenges. This project will leverage the power of Artificial Intelligence (AI) to understand the 3D world and its variations from imagery, developing new theory, algorithms and applications that will be published open-access with open-source code. Together with direct engagement of existing and new partners in government and industry, this will facilitate the translation of research outcomes into products. This research is likely to confer significant economic, commercial, health and environmental benefits across a range of sectors. For example, it could benefit the Australian manufacturing industry by creating 3D models of deformable materials on-the-fly for a robot to manipulate in a factory; benefit older or disabled Australians by aiding the detection of potential hazards in the home and workplace; and benefit all Australians by making future autonomous vehicles 3D-aware, facilitating collision avoidance and energy-efficient navigation. This project will unlock visual AI technologies for vital government and commercial applications.					
DE250100663 Ghelichkhan, Dr Siavash	**Sea Level in the Mid-Pliocene Warm Period: Unveiling Earth's mantle Effects** This project aims to revise our understanding of sea-level change in the mid-Pliocene warm period, a period that closely mirrors the high greenhouse gas levels we anticipate in the coming decades, by looking into solid-Earth contributions. It does so by utilising innovative variational data-assimilation methods that are developed for Geosciences, which enable the assimilation of various observational datasets into models, to reconstruct Earth’s mantle evolution. By connecting mid-Pliocene’s surface movement to other geological observables of various periods, we are able to generate and validate a benchmark for future studies of global sea-level rise and climate change.	81,263.50	161,377.00	156,127.00	76,013.50	474,781.00
	National Interest Test Statement This project delves into the Mid-Pliocene Warm Period, a time 3.5 to 3.0 million years ago that closely mirrors the high greenhouse gas levels we anticipate in the coming decades. As the best natural comparison to our future, this period provides critical insights into potential sea level rises from warming climates and melting ice sheets. However, our understanding of this period is incomplete due to Earth's surface movements, influenced by the mantle's deep forces. This project will provide a robust baseline for this movement through testable reconstructions of Earth's mantle. By looking into the past dynamics of the Earth's deep interior, my research will significantly refine sea level rise predictions for 21st century. This is especially crucial for Australia, where vast coastal communities and delicate ecosystems are at risk from ocean changes. Enhanced predictions will empower policymakers with accurate information to devise robust strategies for environmental conservation and disaster response. Accurate sea level estimates are vital inputs into climate models, which are essential for predicting future climate scenarios. Improving these models helps in planning for climate resilience, thus protecting our communities and natural habitats. This project aims to provide that accuracy, leading to better-informed climate.					
DE250100667 Muehlboeck, Dr Fabian	**Making Efficient Sound Gradual Typing Fit for Industry Adoption** Programming languages enable programmers to express their ideas in a way that suits them, and have the resulting code automatically translated into something a computer can understand. Languages trade off different features against each other to support particular use cases. This project aims to enable a new generation of programming languages that combines the advantages of languages used by professional software developers with the flexibility of widely-used scripting languages, improving the productivity and code quality of programmers of all kinds. To this end, it will solve important problems in the underlying mathematical theory of programming languages. The main benefit is that it will be easier to write safe and yet fast software.	79,638.50	159,277.00	159,277.00	79,638.50	477,831.00
	National Interest Test Statement Currently, the programming languages used by professional software developers in large-scale software projects are often deemed too restrictive for smaller-scale or experimental programming. The many data analysts, engineers, students, administrators, and scientists typically use languages offering fewer safety guarantees and performance improvements, thus creating more error-prone code that wastes energy and resources. Gradual typing is a programming language feature that can theoretically close the gap between these two groups of programming languages and users. However, unsolved fundamental problems in programming language design and implementation are preventing its widespread adoption in widely available languages. Despite intense interest from large companies like Microsoft, Meta, and Instagram, there is still very limited progress. This project will deliver solutions to the above problems and create a prototype language implementation as proof-of-concept. This in turn will allow programmers of all kinds and especially outside of major software companies to enjoy the benefits of professional tools while still enjoying a large degree of flexibility in coding. For Australia, the benefits are increases in productivity, a more level playing field for small businesses competing with foreign IT industry giants, reduced energy use from computers by running code more efficiently, and increased cybersecurity by increasing the use of memory-safe programming languages.					
DE250100709 Kaasinen, Dr Melanie K	**Resolving Star Formation at its Peak** This project aims to quantify where and under what conditions half the stars in today's Universe formed, via a novel approach combining the highest-resolution observations and simulations yet of	81,188.50	161,827.00	161,277.00	80,638.50	484,931.00

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	galaxies at the peak epoch for star formation. Expected outcomes of this project include new insights into how stars form and how the galaxies they reside in settle into disks. Since these research topics are major science drivers for next-generation telescopes like the Giant Magellan Telescope and Square Kilometre Array, this project will benefit a new generation of research. Moreover, through this project, young Australians will receive the scientific and technical training needed to lead this ground-breaking astronomical research. **National Interest Test Statement** The aim of this project is to understand how at least half the stars in today's Universe formed and how their formation shaped the galaxies they reside in. To achieve this, the project capitalises on new high-resolution observations of cold, molecular gas in early galaxies – the stuff out of which stars form. This cold, star-forming gas has barely been studied by Australian astronomers, meaning that the project fills a vital research gap. The project capitalises on Australian taxpayer investment in the Very Large Telescope, strengthening our ties to the European Southern Observatory and its member states. Because this project involves generating and processing large astronomical data sets, it will contribute to development and training in key areas of data science – strengthening Australia's capital in research and innovation. Moreover, this "blue-sky" research will likely lead to technological leaps that cannot be foreseen, like the development of WiFi by Australian radio astronomers. Key research concepts and outcomes will be directly shared with the community through various media platforms and direct (two-way) engagement. In this way, the project will maximise the community's understanding of astronomy and data science. Through engagement with the community, government bodies, and schools, this project will also foster a more diverse and equitable involvement in science.					
DE250100716 Hilton, Dr Courtney B	**Variation in music perception and its psychological and cultural correlates** This project aims to investigate how cultural and psychological factors shape global variation in the perception of music by engaging with ~1 million participants via an innovative web-based citizen science approach, and conducting field-experiments with more remote populations. Through analysing these large and culturally diverse datasets with advanced statistical techniques it expects to uncover new insights about global psychological and musical diversity. Expected outcomes include greater understanding of how and why people's musical experiences vary, and improved research methods for studying larger and more diverse populations. This should improve our ability to inclusively support the benefits of music and to enhance global empathy. **National Interest Test Statement** Music plays an important role in Australians' lives. But the diversity of Australia's multicultural population is poorly reflected in understandings of how people perceive and engage with music. Much of what we know is based on studies of university students in western societies listening to western classical music in a lab. This poorly reflects the musical experiences of most Australians and risks biased conclusions that reinforce stereotypes and assumptions that exclude those already marginalised by their cultural, linguistic, or socioeconomic background. This project uses an innovative web-based citizen science approach to undertake a global census of individual and cultural differences in how people perceive music. Surveying approximately one million participants around the world, the project will deliver new understandings of how cultural and psychological factors shape music perception and explain differences in day-to-day musical behaviour. While contributing to the project, participants will learn about how their perception of music compares to others via interactive and accessible visualisations of their own data. These visualisations, shareable on social media, along with media interviews, will increase awareness about global psychological and musical diversity. This outcome will help music educators be more inclusive, the music industry engage broader audiences, and applications of music in health to be better targeted.	80,988.50	162,427.00	162,127.00	80,688.50	486,231.00
DE250100718 Stephenson, Dr Elise	**Gender inequalities at the frontier: AI, space and climate action** This project aims to investigate gender inequality in policy frontiers focusing on artificial intelligence, space and climate change. It expects to create a more sophisticated framework to help government balance competing priorities in rapidly developing institutions. Expected outcomes of this project include the development of new policy and institutional tools for gender equality, improving our ability to navigate crisis as it arises. This should provide significant benefits, such as advancing debate on how Australia builds new institutions and reforms 'old' ones, using the evidence, knowledge and resources available to pursue both development and equality. **National Interest Test Statement** Rapid technological and environmental changes have put progress on gender equality at risk. Within these changes lies opportunity, yet Australian governments lack the data and policy tools needed to effectively maximise those potential gains while mitigating their harms to gender equality. This situation is demonstrated in three global priority areas - artificial intelligence (AI), space, and climate action. Gender inequities are exacerbated by human endeavour in these fields – for example, the use of AI in areas ranging from recruitment to health technology tend to be biased against women. Mapping the gendered impacts of these 3 cases alongside government policy and institutional decisions, this project will develop a world-first framework to help policymakers understand and navigate new gender equality risks posed by new global policy commitments.	78,913.00	160,140.00	162,675.50	81,448.50	483,177.00

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	A series of domestic and international workshops with government and industry experts, an interactive policy tracker website and a public facing symposium will transfer the knowledge and frameworks necessary to guide the next wave of policy development in these key areas. Through its uptake in government, industry and the community, this research will build expertise and capability among stakeholders to address gender inequities as they form in these rapidly emerging priority domains, enabling Australia to reap the benefits of technological and environmental change as well as advance its commitment to gender equality.					
DE250100739 Davy, Dr Laura K	**Listenability: responsive policymaking for young people** This project expects to assess the extent to which young people with disability and young carers feel heard by policy and service organisations. Using a co-production research approach that centres the voices of young people with lived experience, new knowledge about citizen engagement processes will be generated. Expected outcomes of this project include methodological and theoretical insights into the politics of listening in co-produced research, capacity building for emerging disability and care researchers, and enhanced policy and civil society engagement for young people. This should provide significant benefits in informing and shaping responsive, user-centred disability and carer support for Australia's future.	81,122.50	162,532.00	162,705.50	81,296.00	487,656.00
	National Interest Test Statement Effective engagement with people with disability and carers is critical to developing quality, responsive policy and services. However, many young Australians with disability and young Australian carers have little or no input into how their support services are designed or delivered, which impacts service quality and young people's long-term opportunities and wellbeing. Through in-depth discussions with young people, policymakers and service providers, this project will identify the shortcomings in current engagement practices as well as opportunities for building on good practice. It will develop strategies and guidance for listening to and including young people in service planning and implementation processes more effectively. The project will produce a public report and video summary, as well a practice guide for policy and service organisations which will be distributed widely through peak bodies such as National Disability Services and the Institute for Public Administration Australia. By equipping service providers with knowledge and guidance about better involving young people in their decision-making processes, this project will contribute to the development of more responsive and empowering support. This is expected to benefit young Australians with disability and young Australian carers by leading to services that are tailored to their actual needs and preferences and contribute to improved quality of life.					
DE250100767 Leclerc, Dr Mathieu	**Shifting foodways: biomolecular archaeology and oral traditions in Vanuatu** Food is a key way of understanding connections between past and present communities. This project aims to investigate how ancestral culinary practices in the Oceanic region have evolved over time using residues preserved in pottery. Working in collaboration with communities in Vanuatu, it expects to generate new knowledge of how populations have adapted their diet and developed sustainable food practices whilst navigating through environmental and cultural changes. Expected outcomes include a model for integrating traditional knowledge into contemporary development and food security strategies. This should lead to benefits including increased community resilience and better preparedness for future food and climate vulnerabilities.	80,503.50	161,915.50	162,749.50	81,337.50	486,506.00
	National Interest Test Statement Australia is strongly committed to supporting neighbouring Pacific nations to develop strategies to create stronger and more resilient communities with increased capacity to prepare from disasters and crisis. However, with rapid climate change, food security is a significant threat for communities within the region. Drawing on the traditional knowledge of local communities in Vanuatu, this project will use cutting-edge biomolecular techniques to identify the food residues in archaeology pottery, providing critical information on how past communities have successfully adapted to threats to food security and achieved sustainability over the last 3,000 years. Through roundtables, public engagement events, and educational material, findings will be shared with local communities, Australian foreign aid policy makers and humanitarian NGOs, helping to inform new understandings of how populations may adjust culinary practices to adapt to current and future shocks. This knowledge exchange will deliver both social and political benefits, strengthening the resilience of local communities and building policy and practitioner capabilities to develop more targeted and effective Australian aid responses. Together, this will help to safeguard the liveability of our region, and further strengthen sustainable development in the Asia-Pacific.					
DE250100815 Martinez Rey, Dr Noelia	**Unveiling the full sky with advanced Laser Guide Star technology** Despite advances in telescope size and laser power for satellites, atmospheric correction remains a limiting factor. Laser Guide Star Adaptive Optics addresses this issue but requires a bright star for full correction. This project aims to expand atmospheric correction to the entire sky, overcoming limitations tied to natural stars. It seeks to demonstrate innovative approaches applicable not just to astronomy but also to satellite optical communications, meeting growing data transmission needs. The expected outcomes will include pioneering technology, benefiting the largest telescopes and	81,243.00	162,279.50	158,817.50	77,781.00	480,121.00

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	expanding capabilities in satellite communications. It will position Australia as a leader in both astronomical instrumentation and space communities. **National Interest Test Statement** The challenge of atmospheric turbulence poses a major hurdle in both astronomy and optical communications. This limitation prevents us from capturing clear, detailed views of celestial objects and restricts the efficiency and security of satellite communications. This project seeks to transform these fields by advancing the atmospheric correction systems. The outcomes promise significant impact: in astronomy, clearer images revealing unseen details across the sky; in optical communications, faster, more secure satellite data transmission. This innovation could change the way Australia communicates, offering reliable connectivity for terrestrial, maritime, and airspace applications. This is especially important in the remote areas of Australia, which have historically faced communication barriers. Access to optical communications will connect communities, businesses, and emergency services in these regions. Furthermore, the transfer of technology between astronomical instrumentation and space applications will have a substantial impact on the Australian industry. It will pave the way for low-risk commercial developments with high benefit. Other than the classic outreach venues including conferences and workshops, the results of this project will be disseminated and promoted through visual channels, interviews, and social media. It will reach different audiences, including scientific and governmental organizations as well as the next generation of Australian space workforce.					
DE250100948 Susila, Dr Hendry	**Decoding plant organellar signaling under heat stress** This proposal aims to address a knowledge gap in how plants respond to heat stress, focusing on chloroplasts and mitochondria, essential compartments for photosynthesis and energy production. The key early events by which these organelles transmit signals to the nucleus during heat stress remain unknown. The project expects to unravel the dynamics of communication between plant cell compartments under heat stress, enabling discoveries across stresses and cell types. Anticipated outcomes include multi-faceted spatiotemporal maps of heat signaling in chloroplasts, mitochondria, and the nucleus. This will deliver new targets and strategies for engineering heat-tolerant crops to mitigate future climate challenges. **National Interest Test Statement** Escalating global temperatures have substantial impacts on crop yields, with each one-degree Celsius increase resulting in a 3-7% average reduction in crop productivity, representing multi-billion-dollar losses annually in Australia. Consequently, predicted hotter and drier climates will lead to more severe crop failures and worsening global food security. However, our understanding of early heat stress events, which are crucial for plant adaptation, is limited. By combining cutting-edge molecular biology and synthetic biology tools with high-throughput analysis, this project will explore the cellular signature of plants in the first minutes of perceiving heat stress. Mapping these early events will give a new perspective of how plant perceive and respond to heat. This knowledge will greatly benefit Australia’s agricultural sector by facilitating the design of heat-tolerant crops, essential for mitigating extreme heat events. This aligns with Australia's Science and Research priorities to secure the food supply, boost agricultural resilience, and promote sustainable practices in a changing climate.	81,446.50	162,882.00	160,597.00	79,161.50	484,087.00
	The Australian National University	1,354,491.50	2,713,404.00	2,670,036.00	1,311,123.50	8,049,055.00
	Australian Capital Territory	1,354,491.50	2,713,404.00	2,670,036.00	1,311,123.50	8,049,055.00

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
New South Wales						
Australian Catholic University						
DE250100054	**Bridging the decoding-vocabulary gap during children's reading**	74,116.00	150,439.00	152,874.50	76,551.50	453,981.00
Wegener, Dr Signy V	This project aims to address the urgent problem of low reading achievement by discovering how children adjust their mispronunciations as they learn to read new words that do not follow phonics rules. Using a series of training studies, this project will systematically unpack the factors that could help children to match initial mispronunciations (e.g., "TONG-OO") to correct pronunciations (e.g., tongue) during reading. The expected outcome is the development of a theory of this pronunciation adjustment mechanism that can be used to improve the teaching of reading in primary school. Rapid research translation is an explicit goal of this project so that its findings can have real-world impact on the reading outcomes of Australian children.					
	National Interest Test Statement Learning to read has far-reaching consequences for children's educational outcomes, mental health, financial security and employment prospects. In recognition of the importance of investing in the educational outcomes of our children, Australia spent a record AUD$72 billion on education in 2022. However, despite this record level of spending, the results of the 2023 NAPLAN testing showed that approximately 1 in 3 children failed to meet the expected standard. Thus, more must be done to improve the literacy outcomes of Australian children. A particular challenge faced by children as they learn to read is dealing with the many words in English that have unexpected pronunciations because they do not follow phonics rules (e.g., tongue is read as "TONG-OO" using phonics rules). This project aims discover how primary school aged children learn to read new words, like tongue, that have unexpected pronunciations. This discovery will have important implications for how children should be taught to read. Findings of the project will be communicated in a series of free workshops for classroom teachers and education policymakers, meaning that the outcomes of this project have strong potential for real-world impact in Australian classrooms.					
	Australian Catholic University	74,116.00	150,439.00	152,874.50	76,551.50	453,981.00
Macquarie University						
DE250100275	**Robot Musicians: Long-term Use, Group Dynamics, and Artificial Intelligence**	79,089.50	158,530.00	159,381.00	79,940.50	476,941.00
Savery, Dr Richard J	This project aims to investigate long-term interaction and group dynamics in artificial intelligence (AI), through the lens of robotic musicianship. It will use a custom robot platform and the construction of three new drumming and rapping robots, placing them in musical situations for extended periods and in ensembles. This project will develop new knowledge in how AI can be integrated in daily usage, beyond existing digital interfaces. Expected outcomes include enhanced understanding of trust, fluency, and generalizable approaches to AI. This will provide public benefits by enhancing cultural experiences and developing commercial opportunities through the innovative integration of AI in the creative industries.					
	National Interest Test Statement Addressing a critical time in Australia's technological evolution, this project directly serves the national interest by developing new methods for human interaction with artificial intelligence (AI) and robotics. By 2030, AI and robotics are projected to inject $315 billion into Australia's GDP, reflecting their pivotal economic role. This initiative addresses a critical gap in understanding the long-term and group interactions of human-AI collaboration, essential as AI becomes more integrated into Australian society. It addresses these challenges through the lens of robotic musicianship, an emerging interdisciplinary field combining music, computer science, performance studies, AI and mechatronics. Robotic musicianship offers a unique perspective on practices for AI and robotics, combining a technically complex robotic system, with interaction that requires extensive, expert level domain knowledge from both the human and robot collaborators. The outcomes of this project will be shared widely in public performances with corresponding media appearances, demonstrating AI creative practice and encouraging a society-wide understanding of the future of AI. There are also wide-ranging commercial implications, including opportunities for robots systems to become mainstream tools in professional performance, touring and live performance outcomes, and additions to musical software collaboration.					
DE250100368	**A lone or lonely life? Lived experiences of loneliness in autistic women**	79,053.50	160,328.00	162,636.00	81,361.50	483,379.00
	Autistic people experience depression, anxiety, and suicidality to a greater extent than non-autistic					

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Hughes, Dr Emily J	people. Loneliness has been shown to be an important, causally contributing factor that can exacerbate suffering. Yet, experiences of loneliness in autism remain poorly understood; particularly in the case of autistic women, who are often un-, mis-, or late-diagnosed due to the dominant male-based conception of autism. In redressing this problematic gap, the aim of this project is to characterise experiences of loneliness in autistic women by prioritising their own voices; to determine what these reveal about the autistic self in relation to others; and to use this knowledge to improve the well-being of autistic women across the lifespan. **National Interest Test Statement** This project aims to characterise the experience of loneliness in autistic women. Despite the fact that loneliness contributes to heightened levels of depression, anxiety and suicidality in this cohort, these experiences remain poorly understood. Aligned with the Australian Government's National Autism Strategy (2022), this research will be of significant socio-economic benefit. Firstly, it will give important insight into loneliness as a complex and interrelated driver of poor social, economic, health, and mental health outcomes for autistic women. Secondly, according to the Productivity Commission report (2020), mental ill-health and suicide costs the Australian economy up to $70 billion per year and, as the 'Ending Loneliness Together' project suggests, this cost is compounded by the adverse impacts of loneliness. Loneliness is an important, causally contributing factor to mental ill-health in autistic women. By increasing knowledge about the complex ways in which these experiences intertwine and affect the well-being of autistic women across the lifespan, this project will help to reduce a significant socio-economic burden whilst contributing to the Government’s Strategic Priority of a ‘Healthy, equal and resilient society.’ By facilitating the participation of autistic women in a range of academic and public-facing outputs, including an audio documentary, this project will contribute to a more inclusive Australian society in which autistic women can thrive.					
DE250101076 Tan, Dr Diana W	**Fostering a sense of belonging for neurodivergent university students** This project is the first major study into understanding why neurodivergent students often feel like they do not belong in universities. Using innovative ways to learn how daily encounters at universities can impact neurodivergent students’ sense of belonging, this project will generate new knowledge of what it means to belong and how to foster belonging among neurodivergent students. Outcomes include a better understanding of how marginalised people conceptualise belonging and a practice guideline for the creation of a more inclusive university environment for neurodivergent students. Expected benefits include improved university experiences for these students and contributing to a more inclusive society overall. **National Interest Test Statement** A sense of belonging is a fundamental human need, especially in higher education, where students’ sense of belonging strongly influences their university retention and academic success. Yet, many neurodivergent students often feel unwelcome within the university environment, impacting their sense of belonging and impeding their academic success. This project aims to develop a novel theoretical framework based on the everyday experiences of neurodivergent students in Australia, elucidating factors underpinning university belonging. The theoretical framework will be further translated into a practice guideline, offering cost-effective and feasible solutions to enhance universities' strategic deployment of resources to support neurodivergent students. Anticipated benefits extend not only to neurodivergent students, but also the broader student population, contributing to an overall improvement in university experiences. The recent Australian Universities Accord Interim Report emphasises the pressing demand for university graduates in the Australian job market, with an estimated 60% increase expected from equity groups, including neurodivergent people. This project will be pivotal in equipping universities to effectively support a growing number of neurodivergent students, thus ensuring the viability of the higher education sector and meeting the nation’s urgent need for skilled graduates in the years to come.	81,150.50	162,462.50	162,630.50	81,318.50	487,562.00
DE250101458 Millière, Dr Raphaël	**Philosophical Foundations of Mechanistic Understanding in AI** This project aims to design a comprehensive theoretical framework to understand the behaviour of AI systems mechanistically. By integrating insights from philosophy, cognitive science, and computer science, the project will bridge the gap between the low-level mechanisms and observable behaviours of AI systems. Expected outcomes include the development of novel interpretability methods, significant academic publications including a monograph, an international conference, and enhanced collaborations across global academic and industry sectors. The project is anticipated to advance our theoretical understanding of AI systems and apply these insights to critical safety issues, thereby contributing to the responsible evolution of AI technology. **National Interest Test Statement** The rapid progress of AI technologies presents both extraordinary opportunities and challenges for Australia. As AI becomes more embedded in critical sectors such as healthcare, finance, and administration, its reliability and safety become paramount. The proposed project directly addresses this need by developing a novel framework for understanding how AI systems process information. It will provide a theoretical foundation to transform AI	62,638.50	122,585.00	119,813.50	59,867.00	364,904.00

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	systems from opaque 'black boxes' into more transparent tools, enabling us to predict and control their behaviour, thereby ensuring their safe and ethical application. Beyond its contribution to knowledge, it will significantly benefit Australian society and economy. By increasing the interpretability of AI systems, we enhance trust and efficiency in AI applications, paving the way for more robust, ethical, and reliable AI usage across various industries. This not only bolsters Australia's position as a leader in ethical AI but also safeguards the Australian public from potential risks associated with this technology. Moreover, the project will involve international collaboration with industry leaders and position Australia at the forefront of global AI research. Key outcomes will be disseminated through public engagement to inform the discourse on AI safety. Ultimately, this project aims to ensure that AI, a transformative force in modern society, can be used in a manner that is transparent, ethical, and beneficial for all Australians.					
	Macquarie University	301,932.00	603,905.50	604,461.00	302,487.50	1,812,786.00
The University of New South Wales						
DE250100045	**Addressing teacher workload in Australian education systems**	81,226.00	161,973.50	162,187.50	81,440.00	486,827.00
Stacey, Dr Meghan	Teacher workload is a growing problem in Australia and internationally, but strategies to address it have yet to be tested. This project will investigate teacher workload reduction policies currently emerging across four Australian states. By analysing policy documents and interview data from teachers and policymakers, the project will generate new knowledge about how workload reduction strategies align with the work teachers value, assessing the contribution of such reforms to improving teacher retention at a time of widespread teacher shortages. Expected outcomes of this project include an empirically informed set of principles for the management of teacher workload concerns, to support teacher retention now and into the future.					
	National Interest Test Statement					
	Teacher workload is a growing problem across Australia and the world, impacting attraction and retention at a time of debilitating staff shortages. While governments are now making wide-ranging reforms to address this problem, not all may be effective at meeting teachers' needs and, ultimately, keeping them in the profession. This project will map and analyse public policy responses to teacher workload across the four largest Australian state systems of education, comparing how these represent teaching work with the views of teachers. This will enable insight into whether such policy is likely to contribute to teachers' work satisfaction and retention. Ensuring that teacher workload mitigation strategies are effective will have the following benefits: material benefits for teachers by providing a robust evidence base for improving their working conditions; economic benefits for governments, by delivering a fuller return on their considerable investment in reducing teacher workload; and social and cultural benefits for the broader Australian public, in a more fully supported and engaged teacher workforce. Research outcomes will be promoted beyond academia via outward facing publication platforms and practitioner engagement activities, at which workload management principles will be disseminated and discussed.					
DE250100192	**Explainable Fuzz Testing for Software Vulnerability Detection**	78,166.00	152,607.00	148,882.00	74,441.00	454,096.00
Li, Dr Yuekang	Fuzz testing (or fuzzing), a widely used method for identifying software vulnerabilities, lacks clear explanations due to its inherent randomness, hampering its core mechanisms' comprehension. This project addresses this gap by enhancing the explainability of fuzzing techniques, a fundamental yet understudied research area. It aims to unravel the core mechanisms behind fuzzing by rigorously applying program analysis techniques.The newfound explainable knowledge will systematically improve existing techniques, validate new approaches, and contribute to educating future software developers, ensuring Australia's secure and high-quality software development landscape.					
	National Interest Test Statement					
	Australia's software industry plays a pivotal role in post-pandemic economic recovery, contributing $56 billion annually to the country's Gross Value Added (GVA). Despite this, cybercrime, costing an estimated $42 billion yearly, targets software vulnerabilities as a primary attack vector. This research focuses on elucidating fuzzing, a practical software testing technique for identifying software vulnerabilities. Despite fuzzing's widespread application, its intricate mechanisms lack clarity, impeding advancements. This project aims to fill this knowledge void by systematically unraveling fuzzing's intricacies. By doing so, it seeks to enhance existing fuzzing methods, validate novel techniques, and educate software security professionals. The resulting advanced automated fuzzing techniques can empower Australian software companies to preemptively detect vulnerabilities pre-release, thereby reducing operational costs and fortifying against cyber threats. This heightened software security not only bolsters economic resilience but also contributes socially by mitigating cybercrime risks associated with software vulnerabilities. Furthermore, the explanatory knowledge gained from this research will have educational benefits, nurturing the next generation of software developers in Australia.					
DE250100226	**Neural Empowered Subgraph Query Processing**	74,888.50	149,777.00	149,888.50	75,000.00	449,554.00
Wang, Dr Hanchen	This project aims to develop a neural-empowered model for subgraph query processing, which has					

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	many critical applications such as cybersecurity, biomedicine, and e-commerce. In particular, this project will focus on three core and quintessential subgraph queries: subgraph matching, subgraph counting, and community search. The innovative techniques developed for these queries will be integrated into a unified model, with large graph models as the backbone, heralding a new era of graph databases. Success in this project will establish a foundational advancement in artificial intelligence for databases, offering substantial benefits for applications like cybersecurity, health, and e-commerce. **National Interest Test Statement** Subgraph query processing is a fundamental problem for a wide range of applications. The success of this project will result in ground-breaking advancements in subgraph query processing and the integration of large graph models into graph databases. This will position Australia at the forefront and as a leader in this research domain. The project also has a great value to the development of local industries, ranging from graph databases designing query processing systems, e-commerce systems combating fraudulent attacks, cybersecurity systems detecting malware, and pharmaceutical companies pioneering new drug discoveries. Moreover, the project will also facilitate the training of national most wanted IT professional talents.					
DE250100260 Dikshit, Dr Abhirup	**Is there a link between flash drought and bushfires?** This project aims to quantify the influence of flash drought on bushfires. The project expects to generate new knowledge on the unexplored concerns relating to the anecdotal relationship between flash drought and bushfires. It will extend an innovative approach combining new-generation geostationary satellites with very high-resolution regional climate modeling to quantify flash drought-fire relationships, examine land-atmosphere feedback processes, and predict flash droughts using machine learning. Expected outcomes include enhanced methods to better understand flash droughts and their relationship to bushfires. It should provide significant benefits to the planning for, and management of, flash droughts and bushfires in the future. **National Interest Test Statement** Droughts can no longer be considered ‘slow-moving’. They have become ‘flashier’, a condition where the landscape dries in a matter of weeks rather than months. Anecdotal evidence suggests a connection between rapid drying periods and elevated bushfire activity. Quantifying the relationship between these extreme events using remotely sensed data and data-driven, machine-learning techniques will provide the evidence, or not, of this connection. Outcomes will be shared with fire agencies, and drought monitoring departments to improve decision-making capabilities for food security and biodiversity. This research contributes to Australia’s national interest by improving our ability to better understand and predict extreme dry events. Additionally, the utilization of satellite data in this project will benefit the newly founded Australian Space Agency and will promote Australian contributions to the international space community.	74,338.50	152,547.00	142,387.00	64,178.50	433,451.00
DE250100299 Hill, Dr Clair E	**Language for Country: Perceiving and interacting with Cape York landscape** This project investigates how people perceive and talk about landscape in Indigenous Australian languages. It is widely known that language is intimately connected to Country in Indigenous Australia, however little is described of how languages represent landscape and landscape perception. The project focuses on a language shift context in eastern Cape York, comparing the heritage language of Umpila/Kuuku Ya’u and Lockhart River Creole. Expected outcomes are an understanding of semantic categorisation in language shift and the role of language in land and sea management activities. Endangered language documentation and collaborative work between Elders and younger rangers will assist with language revitalisation and language recognition. **National Interest Test Statement** The project investigates how people perceive and talk about landscape in Indigenous Australian languages, specifically those spoken by Umpila and Kuuku Ya’u people in eastern Cape York Peninsula. The documentation of specialised ways to talk about Country and the conceptualisation of landscape in language will improve understandings of Indigenous knowledges of Country in a region of significant cultural and natural value. Umpila and Kuuku Ya’u lands are noted for their biological richness and many endemic species, taking in parts of the Great Barrier Reef along with the largest lowland tropical rainforest in Australia. An improved understanding of local land and sea management practices via a detailed description of the language used in these activities, and improved transmission of this language knowledge between Elders and younger rangers, has significant cultural and social benefits. The research aligns with the goals of the United Nations International Decade of Indigenous Languages (2022-2032), and the associated Office for the Arts Voices of Country Action Plan to recognise, revitalise and preserve Australia’s unique linguistic and cultural heritage. The project will increase both language access (to heritage language Umpila and Kuuku Ya’u) and language recognition (of the developing Lockhart River Creole), both of which have been shown in Australian Indigenous settings to have significant benefits for social and physical wellbeing.	78,010.00	156,734.50	159,915.50	81,191.00	475,851.00

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DE250100510	**Protecting fertility, family and culture in Fiji**	80,536.00	161,734.50	158,097.00	76,898.50	477,266.00
Mitchell, Dr Elke C	This project will explore the social phenomena of infertility among Indigenous Fijians. This project will generate a new interdisciplinary approach to investigating how different factors such as gender, culture, age, Indigeneity and socio-economic status intersect to influence couples' vulnerability to infertility. Expected outcomes of this project include enhanced understandings of infertility within the key social systems of intimate relationships, families, communities, and (in)formal institutions. This project will provide significant benefits, such as research training for Fijians, extensive international collaboration, and a better understanding of societal responses to reproductive injustices among infertile couples in Fiji.					
	National Interest Test Statement					
	Infertility is an important, yet under-recognised social issue globally. In Fiji, an estimated 12% of reproductive-aged women are infertile, a third higher than the average global prevalence, but little is known about the social and cultural impacts of infertility. This project will provide the first comprehensive anthropological study in the Pacific to examine infertility across the key social systems of intimate relationships, families, communities and (in)formal institutions. Through interviews with couples affected by infertility and practitioners supporting reproductive wellbeing, project findings will provide better understandings of how to reduce reproductive injustices among couples experiencing infertility in Fiji. This knowledge can be used to strengthen national policies related to reproduction, families, culture and social inclusion in Fiji and the region. Outcomes will be accessible to policymakers in Australia (DFAT), Fiji (Ministry of Women, Children and Social Protection; Ministry of Health) and the Pacific (UN agencies) through workshops, detailed reports and an art installation. This project will strengthen the equity focus of Australia's development assistance in our region, with a focus on peoples who are marginalised due to gender, childlessness, Indigeneity and socio-economic status.					
DE250100617	**How do diverse experiences shape face recognition in Humans and AI?**	80,531.50	160,698.00	160,998.00	80,831.50	483,059.00
Dunn, Dr James D	More than any other cue, faces tell others who we are and how we are feeling. Recognising faces and emotions is complex, yet humans have evolved the ability to solve these problems accurately and efficiently. This project aims to understand how unique experiences contribute to expertise in face recognition using computational AI models. This project expects to generate new knowledge on how varying experiences contribute to recognising faces. This knowledge will be used to develop AI that benefits from human expertise. Expected outcomes include improved human and AI accuracy, reliability and transparency for face recognition. This should provide significant benefits for face recognition used in security, policing and the justice system.					
	National Interest Test Statement					
	Australia relies on face recognition to secure access to smart devices, essential government services and the country's borders. Recent concerns about accuracy and fairness in face recognition have spurred calls for improved transparency in its processes. To harness the potential of face recognition for enhanced security and efficiency, this project addresses the critical gap in understanding how diverse visual experiences impact face recognition accuracy and fairness. By exploring biases and improving the accuracy of face recognition decisions made by human experts and AI, our project aims to equip Australia with the knowledge needed for secure identity verification, positioning the country as a global leader in developing, accurate, unbiased and transparent face recognition systems. These outcomes will benefit individuals and communities by ensuring equal access to services, protecting against fraudulent activity and reducing the risk of wrongful arrests, contributing to a safer and fairer Australia. To maximize the impact of our research, we plan to collaborate with government agencies, technology developers, and industry partners, fostering long-term partnerships that will strengthen Australia's security sector and drive the adoption of secure and fair face recognition systems beyond academia.					
DE250100621	**Urine to Liquid Fertiliser Conversion**	81,443.50	162,887.00	162,887.00	81,443.50	488,661.00
Zuo, Dr Zhiqiang	This project aims to develop a process transforming human urine into a safe liquid fertiliser. This project leverages a breakthrough in nitrogen conversion microorganism to create an innovative technology for fully recovering vital nutrients—nitrogen, phosphorus, and potassium—and controlling contaminants—pathogens and micropollutants—in source-separated human urine wastewater. Expected outcomes include a globally applicable, feasible solution for fertiliser bioproduction. By advancing the development of Australia's water utilities and agriculture, the project expects to promote sustainability, resource efficiency, and reinforce the Circular Economy.					
	National Interest Test Statement					
	As a modern, secure, and sustainable food producer, Australia heavily relies on the use of chemical fertilisers, with over 12% imported. This highlights a persistent challenge: some regions still grapple with fertiliser shortages. In response, this project will develop a process to convert human urine into a nutrient-dense liquid fertiliser. Although human urine is rich in essential nutrients and trace elements crucial for plant and soil health, urine					

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	application in agriculture remains underutilised due to significant knowledge gaps in safe fertiliser production. As a consequence, the developed process in this project will ensure contaminant control, including pathogens and micropollutants, in the resulting fertiliser. The transformed urine into safe, high-quality fertilisers can significantly support Australia's agricultural development while benefiting water utilities through urine wastewater separation. By creating an innovative urine wastewater treatment technology, this project will significantly enhance recycled content usage, fortify the sustainability of fertiliser production, and establish a circular nutrient economy in Australia.					
DE250100669 Zinovieva, Dr Olga	**Enhancing properties of advanced 3D printed alloys** The project aims to develop a breakthrough multiphysics simulation framework to tackle the lack of predictability in properties of 3D printed bespoke alloys and enable their knowledge-based 3D printing. The project will generate new knowledge on the microstructure evolution and origins of unwanted process-induced stress in an Australian-developed 3D printed titanium alloy. Expected outcomes include advanced manufacturing routes to control the microstructure and stress to enhance alloy properties and alloy development for defence and aerospace. This will provide strong benefits to national industries through the cost-effective and sustainable improvement of the tailor-made alloy, reinforcing Australian leadership in advanced manufacturing.	81,440.50	162,889.00	162,867.00	81,418.50	488,615.00
	National Interest Test Statement 3D printing falls into the priority area of the Australian economy, enabling local production of value-added customised end-products. The project will address the lack of property predictability in metal 3D printing, which prevents its widespread industrial adoption, by developing a breakthrough cost-efficient simulation-led approach. Through simulation-informed microstructure control, the project aims to enhance the mechanical properties and manufacturability of a new Australian-developed titanium alloy, which has a great potential for lightweight, high-performance structural applications needed in aerospace and defence. Project outcomes will strengthen Australia's world-leadership in the development of advanced materials and boost Australia's competitiveness in the global advanced manufacturing market. The use of simulation-informed 3D printing to produce tailor-made alloys will save on material and energy consumption, offering economic benefits and contributing positively to environmental sustainability, thus benefiting society. The pathway to industry applications will involve future close collaboration with key stakeholders in defence and industry, targeted at producing custom parts with improved mechanical properties, and licensing of intellectual property to industry organisations. Engagement with media and in academia-industry-business events will ensure widespread dissemination for better understanding and translation of the project outcomes.					
DE250100877 Lessio, Dr Martina	**Advancing Plastic Recycling through Computational Catalyst Design** This project aims to develop new catalysts for plastic recycling. Catalytic chemical recycling allows the conversion of plastic waste into high value chemicals and monomers that can be used to generate new virgin plastic, thus achieving the "holy grail" of plastic circularity. This project will use cutting-edge computational chemistry tools and models to unlock the design principles of catalysts for these applications, creating an understanding of how their chemical and structural features affect their performance. Anticipated outcomes and benefits include improved material design and more cost-effective and selective methods for plastic waste conversion into desired products.	75,638.50	151,327.00	153,527.00	77,838.50	458,331.00
	National Interest Test Statement Limitations on plastic waste recycling pose a major challenge to global sustainability. Current methods for eliminating plastic waste are not sustainable and contribute to climate change and pollution. In Australia, only 13% of plastic waste is recycled, resulting in harmful effects to the environment, especially marine ecosystems, and missed economic opportunities. Responding to these challenges calls for cost-effective, new, targeted processes for the conversion of plastic waste into "like-new" plastic materials and high-value chemicals. This project will develop such processes by designing catalytic materials that can convert plastic waste into useful products with high efficiency. Outcomes of the project will directly benefit Australia economically and environmentally while asserting its status as a world-leader in plastic recycling. Technological progress driven by this project will help the Australian manufacturing industry grow in a sustainable way and create new jobs, leading to tangible economic benefits. Environmental conditions in communities and ecosystems affected by plastic production and pollution are also expected to improve. Partnerships with plastic manufacturers will ensure the project makes a positive impact in major industry sectors. Media engagements and outreach activities will take place to share the project results with environmental groups and the general public to raise awareness about the benefits of improved plastic recycling.					
DE250101065 CHENG, Dr QINGQING	**Intelligent sensing and communications for 6G Vehicle-to-Everything Systems** This project investigates the open challenges of integrated sensing and communication (ISAC)-empowered vehicle-to-everything (V2X) systems in sixth-generation (6G) networks. The project expects to advance knowledge and develop pragmatic technologies for realising reliable, efficient and robust ISAC-enabled V2X, by exploiting communication theory, optimisation theory and machine learning technology. The expected outcomes include practical multi-target sensing, self-configurable signal detection, and adaptive resource allocation designs. This project would significantly benefit the	80,968.50	157,614.50	153,259.50	76,613.50	468,456.00

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	Australian vehicular industry and intelligent transportation systems, regarding decreased traffic congestion, improved road safety and reduced vehicle emissions. **National Interest Test Statement** The vehicle-to-everything (V2X) is expected to support a wide range of smart vehicular applications in Australia, e.g., autonomous and driver-assist systems, posing escalating demands for device-environment interactions. The integrated sensing and communication (ISAC) technology has been explored into V2X to satisfy the increasing needs, enabling vehicles to encompass communication and sensing functionalities. However, existing ISAC-based V2X technologies still face critical challenges in reliability, efficiency and robustness. This project addresses these challenging problems by developing novel sensing, detection and resource allocation designs to create reliable, efficient and robust ISAC-enabled V2X systems. This project falls into the Australian Strategic Research Priorities of “Transport”, focusing on autonomous vehicles, sensor technologies and efficient resource allocation. The success of this project will significantly diminish traffic congestion, improve road safety, and reduce vehicle emissions, offering a cost-effective path to enable safer, more efficient and sustainable Australian vehicular and transportation systems. It will greatly contribute to Australia's sustainability goals and promote greener transportation solutions. Additionally, the advanced technologies developed in this project will spur new industries, create jobs and attract international investments, boosting the national economy and improving overall societal welfare for all Australians.					
DE250101200 LI, Dr Zhen	**Tackling instability issue of perovskite toward lab-to-field PV application** This project seeks to address the lab-to-field application gap in perovskite solar cells by advancing the stability of both materials and devices. The research aims to provide novel insights into tackling the outdoor instability of perovskite solar cells by conceptualising key degradation pathways with multi-stage stability assessments and developing novel dual-functional interface materials for enhanced stability. The realisation of high-efficiency and reliable perovskite solar cells through this project is anticipated to enhance the commercial viability of low-cost photovoltaic technology, fostering the growth of the Australian local renewable energy industry for a sustainable future. **National Interest Test Statement** The growing demand for solar energy requires the development of lightweight, affordable, and flexible alternative photovoltaic (PV) technologies that can broaden the application scenarios, such as building integrated photovoltaics. Perovskite PV stands out as a highly promising emerging PV technology. Despite its substantial progress in the laboratory setting, its full-scale field deployment has been hindered by outdoor instability. This project aims to tackle this hurdle and navigate the transition from lab-to-field application, a critical step in making perovskite PV a commercially viable alternative in Australia’s energy landscape, aligning seamlessly with Australia's Science and Research Priorities, specifically the "Energy" priority. The expected outcome of this project lies in maximising renewable energy generation in Australia, leading to more affordable electricity for consumers. Moreover, it will play a significant role in achieving Australia’s aspirations of carbon neutrality by reducing CO2 emissions. Market-relevant intellectual property will be secured and licenced to related local industries to manufacture next-generation solar panels. The evolution and deployment of perovskite PV could stimulate the creation of a new industry in Australia, fostering job creation and economic growth.	76,948.50	156,897.00	159,897.00	79,948.50	473,691.00
DE250101312 Zhang, Dr Fei	**Ionic-electronic conductive elastomer composites for flexible electronics** This project aims to develop a new type of ionic-electronic elastomer composite by interacting ionic liquid and stiff conductive fillers, with a focus on the exploration of the coordination mechanism between multiple networks of polymer, ionic liquid and filler. This project expects to generate new knowledge in the area of functional composites. Stretchable conducting materials are important in the fabrication of soft and stretchable electronic devices (actuators, sensors, cable, etc.) and components (electrodes and wires). The detailed understanding of the ion-electron incorporating system and associated conduction mechanisms will provide an insightful outlook for the future development of advanced flexible electronics. **National Interest Test Statement** Flexible electronics is changing the way we make and use electronics on a global scale. It is estimated that the global market for flexible electronics will surpass $300 billion by 2028. This project will develop new soft conducting materials for the new generation of flexible electronics, an improvement that will revolutionize the performance and comfortability of flexible electronics. This study of new soft materials to discover the relationship between structure and performance will address key scientific and engineering issues in a national research priority area: advanced materials and manufacturing technology. The pursuit of such ground-breaking discoveries in flexible electronic materials aligns with national interest in Australia. The project’s outcomes will go on to transform current methods of flexible electronics, made possible by academic and industrial collaborators in materials and manufacturing technologies. The project will work at the intersection of Internet-of-Things and advanced manufacturing, bringing economic benefits to Australian technology industries that work in wearable and flexible electronics. It is well predisposed to deliver development of technology, progress of knowledge, national economic, commercial, and social benefits through more effectively promoting the progress and development of the consumer electronics industry and thereby improving future competitiveness in the field of electronic technology in Australia.	78,388.50	155,777.00	155,277.00	77,888.50	467,331.00
DE250101315	**Quantum-confined Semiconducting Polymeric Carbons for CO2 Photoconversion**	72,638.50	145,277.00	145,277.00	72,638.50	435,831.00

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Kim, Dr Changmin	Capture carbon by carbon nanomaterials and sunlight. This research aims to realise viable CO2 photoconversion using quantum-confined semiconducting polymeric metal-free carbons. Main objective is to achieve an unprecedented 30% apparent quantum efficiency in the visible light range, which is the most efficient range but never been recorded. The findings of this proposal will address key questions in the emerging field of low-dimensional carbons and semiconducting polymers for light-harvesting, focusing on their notable performance, mechanism, chemistry, and structure-engineering for CO2 photoconversion. This research promises reduced energy costs and enhanced energy security, essential for Australia's transition to a low-carbon economy. **National Interest Test Statement** Australia's ambitious carbon reduction goals, including a 43% emission cut by 2030 and reaching net-zero emissions by 2050, have prompted the initiation of this project. It centres on the advancement of semiconducting polymeric carbon photocatalysts to tackle the prevailing challenges of low activity, limited quantum efficiency, and reduced conversion selectivity. These have the potential to produce clean energy sources by using CO2 as a useful feedstock to achieve a green energy cycle through photochemical conversion. This project leverages Australia's abundant sunlight resource and carbon materials to convert CO2 selectively and efficiently into green fuels. We aim to utilise the wide spectrum of sunlight, especially visible light region, that has not been effectively harvested due to large bandgaps of general inorganic semiconductors – that use a limited ultraviolet (UV) range. Apart from benefits in knowledge, these efforts are key to establishing efficient clean energy production cycles on CO2 photoconversion, ultimately integrating hydrogen energy, and enhancing electricity storage grids in Australia’s renewable energy system. These technologies would significantly boost the renewable energy sector, creating jobs and positioning Australia as a leader in green technology. Ultimately, this project supports the transition towards a zero-carbon energy cycle, aligning with both national and global objectives to reduce greenhouse gas emissions.					
DE250101329 Patel, Dr Vandita	**Forging new links: Diophantine problems, modular forms and number fields** This project will result in a deeper understanding of fundamental objects in mathematics including Diophantine equations, modular forms, and number fields. By applying techniques across mathematics including arithmetic geometry, algebraic number theory, arithmetic statistics, computational number theory and integer programming, we will establish new, concrete links between these fundamental objects. The knowledge transfer enabled through these new links will allow deeper understanding of these fundamental objects. The fusing of varied techniques and international collaboration will reinforce Australia's role as a global leader within mathematics. There is potential long-term benefit to cybersecurity via the study of elliptic curves. **National Interest Test Statement** Numbers have played a key role in human civilisation for over 40,000 years. Numbers may appear simple at first glance, however, there are many mysterious patterns and phenomenon yet to be discovered. This project uses innovative ideas to establish new links between fundamental objects in mathematics to shed light on some of these mysteries. The variety of techniques employed will attract and involve world leaders from key disciplines across mathematics. Australia will become a thriving hub for knowledge exchange, international collaboration and networking at the interface of computational number theory (a current strength) with Diophantine equations and elliptic curves, thereby reinforcing and diversifying Australia's research strengths. Elliptic curves, and more broadly computational number theory, play a key role in practical cryptography, and many digital systems today rely on elliptic curve cryptography. Gaining new insights into elliptic curves will advance Australian research in cybersecurity. Australians will benefit in their daily lives through increased levels of security in communications and financial transactions. There is a global shortage of graduates with strong mathematical abilities, despite a high demand. This project will contribute to the training of students in mathematics which promises a boost to the Australian economy. This project requires little physical equipment and the multiple benefits to Australia makes it exceptionally cost-effective.	80,991.00	154,560.50	146,998.50	73,429.00	455,979.00
	The University of New South Wales	1,176,154.00	2,343,300.50	2,322,345.50	1,155,199.00	6,996,999.00
The University of Sydney						
DE250100146 Pedersen, Dr May G	**Unravelling the stellar interiors of the chemical factories of the Universe** This project aims to determine the interior stellar physics of the most massive stars in the Universe, which have thus far remained elusive due to the lack of suitable observational data for penetrating inside these stars. Stellar pulsations, detectable with the state-of-the-art TESS space telescope, provide direct windows into these stellar interiors and will be used to perform innovative comparisons between stellar observations and theoretical stellar models. This project will result in a more than hundred-fold increase in the number of massive stars with well-defined interior physics,	78,283.50	156,557.00	157,912.00	79,638.50	472,391.00

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	revolutionizing our understanding of the chemical factories of the Universe. This is also in alignment with the decadal plan of Australian astronomy. **National Interest Test Statement** Due to their dynamical lives and explosive deaths, massive stars largely guide the chemical evolution galaxies and impact the formation of new stars and planetary systems. The lives of stars are governed by the physical processes happening inside them. By using the stellar equivalent of earthquakes, astronomers are able to gain insight into the deep internal layers of stars that are otherwise unreachable, even by our largest telescopes. However, this kind of study has not been available for the largest, massive stars, resulting in huge uncertainties in predictions for how old these stars can become and how much they may chemically enrich their environment – until now. This project will explore the shortcoming in our understanding of the fundamental physics of stellar interiors in massive stars by calibrating our theoretical stellar structure and evolution models, specifically using in-situ observations of hundreds of these stars. The program will dramatically increase our understanding of stellar physics, enhancing Australia’s reputation as a global leader in astronomy-based research. Furthermore, the project will provide economic benefits to Australia by providing a training ground for Australian youth to learn skills directly transferable to industry, such as critical thinking and problem solving, an analytical mindset, computational skills for software development and analysing “big data”.					
DE250100266 Zhang, Dr Tianqi	**Plasma-driven electrocatalytic nitrogen reduction** This project aims to reform ammonia production, a crucial chemical for global food and hydrogen storage, while reducing carbon emissions. The goal is to develop a novel method called "hybrid plasma electrolysis (HPE)" to tackle the challenges of sustainable ammonia production. The project addresses the difficulty of breaking nitrogen triple bonds under ambient conditions by using nonthermal plasma to lower the energy barrier for the electrochemical process. This innovative approach could complement the current high-carbon Haber-Bosch process, reducing emissions and promoting sustainability. Overall, this project offers a sustainable solution for agriculture and energy storage, benefiting both farms and communities. **National Interest Test Statement** Ammonia (NH3) stands as a vital synthetic chemical, crucial for sustaining global food production and serving as a potential carbon-free medium for storing and transporting hydrogen. The prevailing Haber-Bosch (H-B) process currently relies significantly on the carbon-intensive methane reforming process, contributing to annual carbon dioxide (CO2) emissions of 300 Mt. Addressing this environmental concern, the pursuit of sustainable NH3 production from green hydrogen sources and utilizing NH3 as a green hydrogen carrier aligns with Australia's National Hydrogen Strategy outlined in 2019. This project aims to address NH3 ambient conditions synthesis through nonthermal plasma technology, utilizing sustainable energy sources. By integrating the Power-to-X (P2X) strategy, which harnesses excess energy from solar, wind, or tidal energy farm, NH3 production can be decentralized. This approach not only contributes to addressing local needs but also enhances agriculture and energy security within communities. Moreover, by adopting such innovative and sustainable practices, Australia is poised to strengthen its position in the global sustainable energy competition.	81,388.50	162,777.00	162,777.00	81,388.50	488,331.00
DE250100398 Moore, Dr Dashiell C	**Archipelagic Connections in Australian and Pacific Literature** Australia is often defined as an isolated island-continent, "girt by sea". This project aims to challenge this protectionist myth by analysing literary and historical connections between different geographical sites that have been represented as enclosed in Australian history. It expects to offer new interpretations of interconnected narratives of Aboriginal Australian, South Sea Islander and migrant enclosure in Australian literature. The project will provide significant benefits, a more inclusive and situated understanding of Australia's connections to the Pacific region, the intersections between colonisation, enslavement, and border protection, and Aboriginal, South Sea Islander, and migrant literatures. **National Interest Test Statement** This project reconsiders Australia's “girt by sea” image through a literary and historical analysis of continuities between various sites of isolation and enclosure: islands, reserves, and detention centres. Using a combination of fieldwork and archival research practices, the project links these sites as a carceral archipelago in order to challenge exceptionalist perspectives of Australian history and literature. The study of these connections will strengthen Australia's links to the Pacific by interpreting literary and historical sources authored by Aboriginal, South Sea Islander, and migrant groups, enabling a broader reading public to grasp intersections between the histories of imperialism, enslavement, colonisation, and border protection. The project also contributes to national strategic initiatives into the 'truth telling' on Australia's past relations to Aboriginal Australians and the study of environmental change in islands and archipelagos. It will promote its findings through a staged series of public- facing outputs including a digital map, a seminar series, a speaker event, and a conference, in addition to published articles and a book-length manuscript with the leading journals and presses in literary studies.	80,429.50	161,743.00	157,627.00	76,313.50	476,113.00
DE250100417	**Next Generation of On-Demand Public Transport: Strategies and Algorithms**	76,388.50	155,777.00	156,777.00	77,388.50	466,331.00

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Fielbaum Schnitzler, Dr Andres Salomon	The project aims to design flexible public transport systems, where on-demand services are integrated with traditional fixed-route lines. The project expects to generate new knowledge in transport science by combining techniques from transport economics and operational research. The intended outcomes of the project include the identification of where, when, and how to use the on-demand services, algorithms to design the whole flexible public transport network, and the identification of the optimal ways to use on-demand public transport in Australian capital cities. This should benefit public transport agencies and users, and on-demand transport operators, ultimately helping achieve more sustainable cities and public comfort. **National Interest Test Statement** Despite the efforts to stimulate sustainable transport modes, private cars are still the preferred mode in Australia, accounting for 57% of the transport-related emissions and billions lost due to congestion. On the other hand, new technologies are changing mobility systems everywhere thanks to the ability of connecting passengers and vehicles online. A significant gap is how to optimally use these technologies to improve Australian on-demand public transport system, identifying when and where to use the on-demand vehicles, and how to adapt the rest of the network. The outcomes of this project will help to design more attractive public transport systems in Australian cities. This brings direct benefits to its users, by experiencing a better quality of service when travelling, provides health and environmental benefits to all its inhabitants by reducing the dependency on private cars, and stimulates economic growth by alleviating congestion. The knowledge gained will be transferred to transport practitioners and authorities (such as TfNSW, TransLink, and on-demand public transport operators), to provide them with strategic insights, quantitative methods and algorithms, and concrete recommendations, to redesign existing public transport networks in Australian capital cities.					
DE250100540 Muller, Dr Eli J	**The brain that steers itself: discovering the rules of neural flexibility.** Understanding human brain function is one the great fundamental problems in scientific research. This project aims to combine theoretical and empirical techniques to reveal how moment-to-moment changes in brain activity supporting flexible human behaviour can be modulated by internal systems in the brain. The results will propel our fundamental understanding of human brain function and what drives adaptive behaviour. Expected outcomes include next generation of whole-brain models, high impact publications, and international collaboration. The anticipated benefits include high-quality training of future Australian scientists and the establishment of Australia as a world leader in neuroscience research. **National Interest Test Statement** This project aims to combine theoretical and empirical techniques to reveal how moment-to-moment changes in brain activity supporting flexible human behaviour can be modulated by internal systems in the brain. This project will benefit Australian's by promoting how the human brain is a dynamic and ever-changing organ shaped and constrained by biological forces. This has social implications spanning the structure of the education system – in particular the teaching formats – as well as social and cultural equality, whereby the project will humanize individuals placing them in a broader biological ecosystem. It will also generate research jobs for Australians and promote economic growth in technology sectors vital for a financially successful future Australia.	78,696.00	157,859.00	158,811.00	79,648.00	475,014.00
DE250100572 Suo, Dr Si	**Study on the impacts of salt precipitation on underground hydrogen storage** Salt precipitation induced by saline water evaporation poses a unique challenge in underground hydrogen storage, leading to significant hydrogen loss, reservoir degradation, and potential site failure due to salt accumulation. This project aims to understand its underlying multi-physical nature using novel experimental and advanced numerical approaches. Expected outcomes include delivering new insights into strategies to suppress salt precipitation and developing advanced predictive tools for aiding decision-making and operation-optimising in practice. This should provide significant benefits, such as fostering the development of sustainable hydrogen-based energy assets in Australia and bolstering its standing in the global energy market. **National Interest Test Statement** Hydrogen, as a high-capacity energy carrier, has been listed as a prioritised energy option in many nations. Australia has the ambition of deploying hydrogen as a vital export commodity to profit from the growing global demand for hydrogen. Underground Hydrogen Storage (UHS) in specific geological formations, such as saline aquifers referring to underground porous rocks containing salty water, emerges as a promising solution given their storage capacity and geographical availability in Australia. However, salt precipitation induced by saline water evaporation causes heavy clogging in geological formations and severely impacts storage safety. This project will improve our understanding of this phenomenon, especially the underlying physics and mechanisms. Furthermore, advanced predictive tools will be developed for exactly assessing its impacts on UHS for any given geological	77,888.50	155,777.00	155,777.00	77,888.50	467,331.00

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	and operational conditions. The translation of the research outcomes on technically suppressing salt precipitation in UHS will be facilitated and supported through communicating and collaborating with industry partners and government agencies. This research will not only advance our scientific knowledge of energy storage but also contribute to constructing manageable hydrogen-based energy assets and realising the transition toward a sustainable, low-carbon future in Australia.					
DE250100611	**Uncovering fungus-bee interactions for pollinator and ecosystem health**	81,441.50	161,625.50	159,682.50	79,498.50	482,248.00
Fernandes, Dr Kenya E	This project aims to uncover complex interdependencies between fungi and bees to provide new insights into the impact of fungi on pollinator health and ecosystem dynamics. Through a multidisciplinary approach combining microbiology, ecology and chemistry, this project expects to generate new knowledge of fungus-bee associations via study in an Australian context. Anticipated outcomes include identifying key fungi linked to bees, elucidating their role in bee health, and evaluating bees as vectors for fungal dispersal. Enriching our understanding of these dynamics could have far-reaching implications for biodiversity conservation and environmental stewardship, contributing to resilient ecosystems, food security, and sustainable agriculture.					
	National Interest Test Statement					
	Increasing threats to bee populations worldwide pose unprecedented challenges. Understanding and managing factors affecting bees and their ecosystem services are crucial for preserving global food security and biodiversity. This project addresses a critical knowledge gap by focusing on the often-overlooked interactions between bees and fungi, aiming to unravel the impact of fungi on bee health and nutrition and the role of bees in fungal dispersal. In the short term, this research will inform management practices in horticulture and apiculture, enhance sustainable bee pollination of crops, and bolster Australia's managed pollinator industry. In the longer term, this research has the potential to reshape our understanding of insect population dynamics, guide the development of eco-friendly pest control strategies to preserve bee and fungal diversity, and inform strategies for mitigating the spread of harmful pathogens in ecosystems. Collaborative efforts with beekeepers and conservation groups will promote interest, awareness, and informed sustainable management practices for the long-term benefit of bees and ecosystems.					
DE250100670	**Taking the next step to understand natural perception**	80,493.00	161,670.00	159,974.50	78,797.50	480,935.00
Davidson, Dr Matthew J	A recent discovery showed that the simple act of walking produces cyclical modulations of perception and behaviour with every step. This project will uncover the fundamental links between movement and cognitive function, specifically changes in the perception of vision, sound, and attention to the environment. This will be achieved through the simultaneous recording of neural activity, movement patterns, and physiological signals in an immersive 3D virtual reality environment. This project will develop a new multidisciplinary research platform positioning Australia at the forefront of cognitive neuroscience research, and enable breakthroughs that will establish the optimal timing for cognitive performance during active behaviour.					
	National Interest Test Statement					
	Movement is a hallmark of natural behaviour, yet the influence of movement on our cognitive function is often overlooked. My recent work has shown that the ability to perceive and attend to the world is impacted by the common act of walking, which produces brief periods of good and bad performance within each step. This project will quantify these step-related changes to determine how the ability to see, hear, and attend to an environment are modulated by the act of walking. The project will develop a multidisciplinary research platform combining psychology, movement science, neuroscience, and virtual reality. This will position Australia at the forefront of new initiatives to conduct ecologically valid research in psychology and cognitive neuroscience. This will provide exceptional training opportunities for Australian researchers, and fundamentally advance scientific understanding by unveiling the link between the body and the brain during an everyday behaviour. By establishing the timing of peak cognitive performance within each step, the outcomes of this project have clear applications in various defence and training contexts such as education settings, workplaces, sports and rehabilitation environments where optimal cognitive performance and timing are required in a dynamic environment.					
DE250100746	**Safeguarding ecosystems from impending invasions**	81,418.50	162,502.00	158,247.00	77,163.50	479,331.00
Wong, Dr Mark	Biological invasions are a leading cause of extinctions and a multi-trillion-dollar socioeconomic problem globally. Focusing on ants, among the planet's most harmful invasive organisms, this project aims to build a general and predictive understanding of the causes and consequences of biological invasion, by investigating how alien species' traits and ecological strategies influence their capacities to spread globally and invade local communities. Moreover, through extensive fieldwork and experiments, this project will uncover the susceptibility of Australia's ecosystems to ant invasions, and identify solutions for safeguarding ecosystems that are grounded in a deep understanding of the fundamental mechanisms structuring biodiversity.					

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	National Interest Test Statement Invasive ants severely threaten biodiversity, agriculture, and public health in Australia, costing the economy over $33 billion to date, with costs expected to rise further. The detection and eradication of invasive ants are the country's first lines of defence, but these measures are far from infallible. Moreover, the burgeoning spread and recurrent outbreaks of invasive ants in recent years highlight a pressing need to fortify the resistance of Australia's ecosystems to impending invasions. This project – combining ecological theory, extensive surveys and innovative experiments in Australian ant communities, as well as unprecedented data on global ant movements – will uncover and address the vulnerability of Australia's biodiversity and ecosystems to ant invasions. The research will explore solutions for bolstering the resistance of susceptible ecosystems to impending invasions that are grounded in a deep understanding of the fundamental mechanisms structuring their insect communities and ecosystem functions. These outcomes will enhance biodiversity conservation and promote significant economic benefits for Australia by reducing harm from invasive species to agriculture and public health.					
DE250100827 Pearson, Dr Natali	**Sunken Warships: Heritage Diplomacy in Maritime Southeast Asia** This project analyses the politics of maritime war heritage in a region of significant geopolitical complexity and strategic importance for Australia and the world. Focusing on Allied naval vessels from World War II, it addresses the unique political, social and environmental challenges posed by the presence of these wrecks in Southeast Asian waters. The project expects to generate insights into the way power is advanced in the modern era and the value of heritage diplomacy as a tool for analysing changes in our region. Outcomes would include a conceptual model of the dynamics of heritage governance in the 21st century. The project will enable the development of new approaches that can optimise heritage policies and outcomes globally.	81,140.50	162,301.50	161,891.50	80,730.50	486,064.00
	National Interest Test Statement Geopolitical tensions between rival global superpowers are intensifying in our region. In maritime Southeast Asia, rivalries take the form of disputes and overlapping claims to territory and resources. This region is also home to more than 2000 warships wrecked during World War II. The presence of human remains, unexploded ordnance and leaking oil means that these ageing wrecks need to be managed with great care and sensitivity. Decades of neglect have turned them into diplomatic time-bombs, with potentially damaging consequences for nation states and communities at home and abroad. This project examines the geopolitical significance and diplomatic implications of maritime war heritage in a region of key strategic importance for Australia and the world. Key project findings will be disseminated to policymakers and heritage practitioners across the region, to optimise policies and outcomes for difficult heritage sites not only in neighbouring Southeast Asia, but worldwide.					
DE250100999 Doheny, Dr Patrick W	**Kagome frameworks as a platform for the development of quantum materials** This project aims to develop design strategies for the development of next generation computing and data storage materials. By focusing on new methods to control unusual magnetic properties, this project will expand the design space for the development of new materials for quantum computing and data storage applications. Expected outcomes are the deeper fundamental understanding of magnetic properties in materials and new, innovative methods by which these properties can be controlled and harnessed. The benefits of this research lie in the development of new design principles for next generation computing and data storage devices, the training of researchers, and the expansion of Australia's world-class reputation in materials research.	81,142.00	160,680.50	157,427.00	77,888.50	477,138.00
	National Interest Test Statement The development of the next generation of computing and data storage is set to change the way we live and work, however, to realise this, greater fundamental understanding of materials design and properties is required. The outcomes of this project will create porous materials exhibiting unusual magnetic properties and new approaches by which these can be controlled. This will generate an exciting platform for the development of future high-performance computing and data storage materials. This project aligns with Australia's 2023 National Quantum Strategy with the development of advanced materials and training of world-class researchers that are essential to the growth of Australia's quantum industry. The outcomes of this project will provide valuable tools to academic and industrial researchers in materials design, strengthen Australia's world-class reputation in quantum materials research and contribute to the development of Australia's quantum economy, expected to be worth $2.2 billion by 2030.					
DE250101001 Ho-Nguyen, Dr Hung N	**New Theory and Methods for Multi-Stage Optimisation with Contextual Data** Multi-stage optimisation models are used for solving various complex sequential decision-making problems. This project aims to develop new theory and methods for incorporating contextual data into multi-stage optimisation, thereby allowing models to utilise numerous data sources for more effective data-driven decision-making. Expected outcomes include foundational theory to guide practical design of new methods, establishment of principled risk management techniques via statistical	79,678.50	155,567.00	155,567.00	79,678.50	470,491.00

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	confidence guarantees, and comprehensive case studies on important applications. This will provide new and improved methodologies for solving important complex problems in energy operations scheduling, disaster risk management, and finance. **National Interest Test Statement** As Australia continues to increase its capacity to collect, store and manage data, significant benefits can only be realised through the continual development of techniques to draw insights from the data. Mathematical optimisation provides systematic tools to turn data into decisions, yet these tools must now be updated to handle the richer sources of information available. This project will develop new theory and methods for optimisation which can exploit numerous data sources, with the aim of improving the quality and reliability of data-driven decision-making techniques. This will lead to improved solutions for a range of critical decision-making problems in several domains, including renewable energy, disaster risk management, financial asset management, and public health policy. The project will also increase Australia's research and data science capabilities through the training of PhD and Honours researchers in cutting-edge analytical tools from optimisation, statistics and machine learning.					
DE250101030 North, Dr Rachel A	**Exploring molecular mechanisms underpinning nutrient transport in the brain** Cells from all life forms are separated from their environment by lipid membranes, but to survive, they also need to exchange molecules such as nutrients with the environment. Nature solves this problem by embedding transport proteins into membranes to guide molecules into and out of the cell. These transport proteins are vital for a plethora of physiological processes and regulate nearly all aspects of cell function. The outcomes of this study will reveal new and fundamental knowledge of how these proteins work in the brain, and enhance our understanding of the brain's core infrastructure. This project will benefit structural biology and biophysics training, and yield new insights of fundamental importance to human physiology. **National Interest Test Statement** Cells from all life forms have a barrier membrane that separates them from the external environment. This membrane contains nanoscale machines that control what moves into and out of cells, but we do not know what they look like or how they work. These machines are vital for many critical processes including how cells absorb nutrients, and how cells communicate with each other. This project will generate new knowledge of how these nanoscale machines work in the brain, alluding to their fundamental roles in human physiology. This project will provide training in the use of cutting-edge infrastructure and innovative scientific techniques that are needed for jobs in Research and Development across Australia's higher education and pharmaceutical sectors.	81,448.50	162,892.00	162,872.00	81,428.50	488,641.00
DE250101250 Li, Dr Mengyu	**Sustainable, resilient and affordable net-zero transitions for Australia** This project aims to identify long-term scenarios for Australia's net-zero emission future to be affordable, sustainable, secure, and resilient under unforeseen events. Using interdisciplinary approaches that integrate advanced Integrated Assessment, Energy System, and supply-chain disruption modelling, this project expects to create the Australian Resilient Transition Lab, a state-of-the-art computational collaborative research platform to enable the planning for resilient energy and food futures. This should provide significant benefits to establish Australia's capacity for future scenario modelling that complies with international practice, and to build the long-term resilience of Australia's transition to net-zero emissions. **National Interest Test Statement** This project responds to calls by Australian policymakers to i) boost supply chain resilience, ii) increase national self-reliance and security, and iii) respond to climate change. It will build the Australian Resilient Transition Lab to house cutting-edge energy and food system modeling capabilities and to work with government and industry to determine a resilient, affordable, and sustainable net-zero future for Australia. Outcomes will benefit Australian decision-makers in designing policies to prevent or minimize future natural disaster damage through an 'early warning system', capable of hedging risks and optimising adaptation strategies. The project directly relates to the Australian Government Science and Research Priorities: Food, Energy, and Environmental change. It directly aligns with multiple state- and national-level strategies to facilitate Australia's transition to net-zero emissions (e.g., Long-Term Emissions Reduction Plan) and build system-wide resilience in Australia (e.g., NSW Climate Change Adaptation Strategy, Queensland Strategy for Disaster Resilience, and National Climate Resilience and Adaptation Strategy).	72,738.50	145,977.00	146,477.00	73,238.50	438,431.00
DE250101332 Yue, Dr Chentao	**Intelligent self-configurable coding and decoding for 6G wireless networks** This project aims to develop advanced channel coding and decoding (CODEC) theories and technologies for 6G networks. 6G requires extreme ultra-reliable, low-latency communications for	73,998.50	149,997.00	152,417.00	76,418.50	452,831.00

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	dynamic applications such as remote surgery and autonomous vehicles. Existing CODEC methods, optimised for fixed network environments, cannot meet this stringent demand. The project targets an intelligent, self-configurable CODEC solution. To achieve optimal communication quality, it will autonomously adapt encoder and decoder designs for dynamic application demands and network environments with signal variability. The outcomes will be crucial for 6G network deployment in Australia, enhancing key sectors like factory automation, energy grids, and healthcare.					
	National Interest Test Statement					
	6G represents a major leap in wireless communication. Beyond improved mobile telephony, 6G promises extremely reliable and low-latency networks to support everything from swift movie downloads to autonomous driving. This project aims to realise these advancements by developing innovative channel coding and decoding technologies, which are pivotal for the next decades of 6G network deployment in Australia. The new technologies will enhance wireless networks to perform a hundred times better than current 5G capabilities in speed, reliability, and latency. This will significantly enrich everyday life, not only by enhancing mobile phone services, but also by enabling novel experiences such as VR online gaming, tactile networks, and meta-verse interactions. The project will also have a substantial broader implication for Australia. The enhanced connectivity will facilitate advanced healthcare with remote diagnoses and telesurgery, support cutting-edge applications such as collaborative autonomous driving, and greatly improve the productivity of mining and manufacturing industries. The project is dedicated to delivering practical 6G coding and decoding solutions using novel theories, algorithms, and AI technologies. In advancing 6G networks, the project will partner with telecommunications, healthcare, and advanced manufacturing sectors. These collaborations aim to integrate this enhanced connectivity into commercial applications, industrial ecosystems, and everyday technologies.					
DE250101403	**Design optimisation of recoverable lattice structures for multiple impacts**	81,400.50	159,882.00	156,490.50	78,009.00	475,782.00
Qiu, A/Prof Na	Many protective devices need to take multiple impacts. This project aims to develop a new design framework for recoverable, crashworthy and lightweight structures by taking up the latest advances in computational optimisation, artificial intelligence, and additive manufacturing. It will develop novel multiscale topology optimisation algorithms to seek new restorable lattice structures for multiple impacts with fabrication-induced uncertainties. It will generate new methodologies for nondeterministic design of multiscale lattices with recoverable mechanical properties. This will significantly benefit transportation, healthcare, and sports fields by enhancing crashworthiness and recoverability for next-generation protective devices.					
	National Interest Test Statement					
	1. This project aims to optimise recoverable lattice structures for protective devices subject to multiple impacts. It will fill a significant research gap on lightweight crashworthy structures with effective recoverability against recurring impacts, potentially developing new-generation customised protective devices for Australia. 2. The project will develop a new topology optimisation framework for parameterised multiscale lattice structures made of recoverable polymeric materials, thereby impacting on a similar area involving other recoverable materials. 3. The protective devices such as motorcycle helmets, insoles/midsoles play a significant role in reducing fatality and avoiding sports' injuries. It is of considerable significance to develop novel lightweighting structures with tailored crashworthy and recoverable characteristics. 4. This project signifies interdisciplinary research in data science, advanced materials, computational mechanics, structural optimisation, and advanced manufacturing. The research will be of certain practical value and tremendous interests in automotive, aerospace, sport and maritime industries.					
DE250101417	**Robust Neural Radiance Fields for Trustworthy 3D Generation**	73,888.50	147,777.00	147,777.00	73,888.50	443,331.00
Fu, Dr Huan	This project aims to pioneer an innovative 3D generation scheme driven by Neural Radiance Fields (NeRF), enhancing reliability and accuracy. The research endeavors to explore a robust NeRF representation for comprehensive and effective 3D object and scene representation, addressing major challenges in 3D generation and taking a significant step towards next-generation 3D GenAI. Anticipated outcomes encompass the development of novel algorithms for robust NeRFs, resulting in a trustworthy 3D model and scene generation AI framework. These advancements are positioned to deliver significant benefits to science, society, and the global economy by facilitating efficient digitalization, immersive visualization, and virtual simulation capabilities.					
	National Interest Test Statement					
	The project "Robust Neural Radiance Fields for Trustworthy 3D Generation (RNeRF-T3G)" holds immense potential for delivering substantial benefits to the Australian community across various domains. In the short term, advancements in 3D technologies, facilitated by RNeRF-T3G, can spur innovation in virtual reality, gaming, and simulation industries, leading to economic growth and job creation. In the medium term, the application of 3D generation in e-commerce promises enhanced online shopping experiences, contributing to the commercial sector. Additionally, realistic 3D models can play a pivotal role in architectural and real estate sectors, aiding informed decision-making and visualization. From an environmental perspective, RNeRF-T3G can contribute to sustainable urban planning, optimizing land use and reducing environmental impact. In the longer term, the					

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	manufacturing sector can benefit from resource-efficient 3D applications, promoting sustainability and environmental responsibility. Socially, healthcare stands to gain from simulated medical training, ultimately improving outcomes. In the realm of education, the integration of 3D models enriches learning experiences by simplifying complex concepts. To achieve these outcomes, it is necessary to collaborate with industry partners, work together to foster meaningful cooperation, and ensure the dissemination of research findings to the relevant audience.					
DE250101422 Li, Dr Jiaying	**Unravelling fate of pathogens in sewers to advance wastewater surveillance** This project aims to elucidate partitioning, degradation, and persistence of pathogenic virus gene fragments in sewers, advancing wastewater surveillance for various pathogenic diseases. By combining novel techniques across sewer engineering, microbiology, and modelling, this study for the first time addresses critical gaps in understanding fate of viruses under impacts of biofilms and hydraulic changes. Expected outcomes include new knowledge on suitable virus gene markers for reliable wastewater monitoring and a novel fate model capable of accurate infection prediction. Benefits of improved wastewater surveillance capacity extend broadly, contributing to a better safeguard of Australian community against emerging diseases beyond COVID-19. **National Interest Test Statement** Wastewater surveillance is a vital public health tool for COVID-19 in Australia, which now requires expansion for broader pathogenic viruses and emerging health threats. This DECRA develops a state-of-the-art program that allows for elucidating the stability and fate of virus gene fragments in sewer systems, which is critical to the accurate wastewater-based estimation of actual infection prevalence in the population. The improved wastewater surveillance significantly complements public health due to its real-time, cost-effective, and non-invasive features, overcoming limitations of traditional clinical-based methods in terms of cost, time, and bias, hence delivering substantial benefits to stakeholders in water and public health sectors. It has far-reaching impacts on reforming the next-generation public health system, with a great potential to reduce pathogenic diseases in Australia and worldwide, and further contribute to economic resilience. Aligned with the National Science and Research Priority of Health and National Preventive Health Strategy, the project demonstrates Australia's commitment to safeguarding public health and wellbeing against emerging diseases, with great significance to low-resource areas including First Nations communities.	78,948.50	160,397.00	162,897.00	81,448.50	483,691.00
DE250101487 Ravindran, Dr Anil	**Bio-Inspired Multi-scale Strengthening of Lightweight Renewable Structures** This project aims to develop strategies in enhancing the functional behavior of lightweight structures used in renewables by emerging bio-inspired multi-scale strengthening approaches. This project expects to develop new knowledge in strengthening mechanisms of fibre composites, within applications such as the wind turbine energy sectors. Expected outcomes include identifying novel manufacturing pathways, and increased understanding of the synergistic structure-property-relationship in hierarchically or bio-inspired engineered structures containing constituents at multiple length scales. This should provide benefits to Australia by providing cost effective manufacturing routes for structures also applicable in civil and aerospace domain. **National Interest Test Statement** Due the recent climatic shifts, there is a sovereign need within Australia to increase the Net Zero carbon emission capability by 2050 and 82% renewable energy share through smart green technologies such as off-shore and on-shore wind turbine blades. With over $12.4 BN of investment within Australia, large span wind turbines with greater energy throughput are needed to be reinforced with lighter, stiffer, and stronger materials such as carbon fibre composites. However, a long-standing problem with currently established carbon fibre reinforced composites are their brittle properties, poor crashworthiness and lack of functionality or recyclability. This project will solve these issues developing novel multi-scale design methodologies for composites that are cost-effective and readily translatable into existing supply chains. Taking inspirations from nature, over the traditional carbon fibre composites containing a single phase of reinforcement binded in a brittle polymeric phase, the multi-scale strengthening processes by careful hierarchical tailoring of nanoscale and micron-scale reinforcements and mendable materials will allow for these lightweight composite structures to exhibit structural resiliency, functionality and lifespan that is greater than the sum of their individual brittle constituents. The current project will generate new science and IP of commercial and national benefit to manufacturers across a broad range of other construction industries.	77,888.50	155,777.00	155,777.00	77,888.50	467,331.00
	The University of Sydney	1,498,700.00	2,997,535.50	2,987,178.00	1,488,342.50	8,971,756.00
University of Technology Sydney						
DE250100356 Yi, Asst Prof Bowen	**Learning to see latent variables: Robotic state estimation made scalable** This project aims to develop a novel optimisation-based framework to ensure computationally efficient and resilient real-time estimation of latent variables. Robots have numerous unmeasurable	74,238.50	150,977.00	153,477.00	76,738.50	455,431.00

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	latent states crucial for decision-making, monitoring, prediction, and for designing controllers that interact with the real world. However, challenges in computational scalability and long-term performance in current estimation methods are not well understood. This research will lead to new knowledge, approaches, and algorithms that achieve high-performance robotic estimation. Such advancements will benefit robotics, industrial automation, control engineering, and other fields that demand state estimation within the broader Australian communities. **National Interest Test Statement** The realm of robotics and intelligent systems is currently undergoing rapid transformation, exerting profound impacts on various industries, labor markets, and daily life. Their indispensable roles span across applications such as smart power grids, self-driving cars, mining robots, and critical infrastructure. This project will provide advanced knowledge in the area of nonlinear estimation theory, leading to the development of high-performance and computationally scalable estimation algorithms for industrial applications. These applications will have a significant impact in robots and intelligent systems that heavily rely on real-time access to latent variables derived from data and models, instrumental for effective decision-making, monitoring, and control. The outcomes of the project will enhance Australia's international standing in autonomous systems, intelligent robotics, and industrial automation, to "build new industries and accelerate productivity by having sovereign knowledge" in all areas related to real-time estimation techniques. Aligned with several of Australia's National Science and Research Priorities (draft 2023), including "Advanced Manufacturing" outlined in the 2015 version and "Priority 3 - Enabling a productive and innovative economy" (specifically in the field of robotics), the project will ultimately have a broad impact on Australian society through economic and social benefits, and attract overseas investment to Australia.					
DE250100363 Fang, Dr Zhen	**Transfer Learning for Reliable Data Detection in Open-set Environments** There is an urgent need to develop a new machine learning scheme in open-set environments to enhance the reliability of machine learning models. This project aims to use transfer learning to enhance the reliability of machine learning models when encountering unfamiliar objects, which are known as out-of-distribution data. The project involves: developing novel machine learning theories to guide method design; novel frameworks that are distribution-robust to transfer knowledge from available related datasets; and novel compatibility-aware frameworks to transfer knowledge from available models. The outcomes are expected to enhance the reliability of machine learning, yielding benefits for responsible artificial intelligence. **National Interest Test Statement** The project explores a frontier in responsible artificial intelligence (AI): how to enhance the reliability of machine learning when the labelled data are limited. Aligning with Australia's AI Ethics Principles, this pioneering direction in responsible AI will enhance Australia's research impact and reputation in the field. It will support our nation's cybersecurity efforts by developing reliable out-of-distribution intrusion detection systems that can identify new cyberattacks. This improved cyber infrastructure will benefit the entire knowledge economy, including government, businesses, and emergency services. The project will also support Australian small-to-medium-sized enterprises by developing out-of-distribution detection systems to increase the reliability of business intelligence systems. Ultimately, better decision support for small-to-medium-sized enterprises will benefit the entire Australian economy. The project will also contribute to enhancing the reliability of decision-making systems for government. To enhance the impact of this project’s research outcomes beyond academia, it is crucial to showcase how the knowledge generated can be translated into practical future applications. The research will be conducted through direct engagement with industry stakeholders. Such interaction is key to demonstrating the real-world applicability and advantages of the research and to encourage its broader implementation and use.	76,388.50	151,402.00	150,027.00	75,013.50	452,831.00
DE250100427 Chen, Dr Shulin	**Empowering Millimetre-wave Communications with Magneto-electric Surfaces** This project aims to pioneer intelligent filtering magneto-electric surface technology, paving the way for 5G and beyond 5G millimetre-wave (mmWave) communications systems. This project marks a substantial advancement in the field of antennas and wireless communications technologies. The expected outcome of the project is to develop an intelligent filtering magneto-electric surface system with beamforming capabilities to enable the effective management of signal interference and overcome the coverage limitations for mmWave systems. The intended intelligent system supports the Australian Government’s vision for robust and future-proof connectivity, embodying a commitment to pushing the boundaries of the current communications systems. **National Interest Test Statement** Due to Australia’s vast size and dispersed population, we face many challenges in providing high-quality communications services across the country. This project is at the forefront of pioneering advanced antenna sciences and technologies for 5G and beyond-5G millimetre-wave (mmWave) wireless communications. It aims to overcome critical challenges in signal coverage and interference management to support fast and reliable mmWave communications access to all Australians, irrespective of their location, to support economic growth, education, healthcare, and overall societal development. This project’s core innovation lies in the intelligent filtering	72,938.50	145,877.00	147,877.00	74,938.50	441,631.00

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	magneto-electric surface technology and stands out for its adaptability and electromagnetic friendly approach, enabling the practical and effective deployment of mmWave communications technology. Collaboration with leading telecommunications companies, including Telstra, has validated the technology's practical relevance and potential for widespread adoption. The development and implementation of this technology will directly contribute to the Critical Technologies in the National Interest, as we move to a digital economy. This project also promises substantial enhancements in communications connectivity and services, enabling economic and social benefits to Australian industries and businesses to be more productive and competitive - while also laying the groundwork for Australia's future in global telecommunications innovation.					
DE250100444 Espinoza Vergara, Dr Gustavo A	**Uncovering the colonisation of newly-recognised 'trojan horses' of bacteria** This project aims to investigate the basic biological mechanisms of the enhanced colonisation of host cells by a newly discovered vector for transmission of bacteria. The vector consists of packages of live bacteria enveloped in a membrane made by natural bacterial predators. The colonisation mechanisms of bacteria carried in these vectors are unknown. This project seeks to reveal these mechanisms using innovative molecular techniques. Anticipated outcomes include new knowledge about pathogen transmission and the potential for further research into pathogen control. This should provide significant benefits such as fundamental knowledge that may revolutionise the study of opportunistic pathogens transmitted from the environment.	81,173.50	149,397.00	134,869.50	66,646.00	432,086.00
	National Interest Test Statement Bacterial gut infections are a persistent and increasing problem in Australia and globally. The lack of effective control measures underscores the urgent need for a better understanding of how they are transmitted. I have discovered a new transmission vehicle for gut-infectious bacteria that occurs naturally in the environment. The vehicle comprises of packages of bacteria enveloped in a membrane that enhances their infectivity. This project aims to reveal the unknown mechanisms behind this behaviour using advanced molecular technologies. The findings have the potential to revolutionise the approach to intestinal infection research globally. The insights obtained will enhance our understanding of the true transmission pathways of intestinal pathogens and raise public awareness to accelerate preventative strategies to track these vehicles in the environment. They will serve as a robust foundation for the development of targeted treatment strategies, offering a more effective and nuanced approach. Innovative strategies for controlling gut infections, particularly targeted interventions, can provide substantial economic benefits by reducing costs associated with treating gastroenteritis. It can also unlock commercial potential by driving new product development, creating employment and investment opportunities. Importantly, by advocating for the use of targeted technologies as alternatives to antibiotics, this project addresses the global concern of antimicrobial resistance.					
DE250100485 Li, Dr Xuan	**Next-generation resilient concrete for wastewater infrastructure** This project aims to develop a novel corrosion-resistant concrete to provide cost-effective, long-lasting, and eco-friendly corrosion control in wastewater infrastructure. In Australia, concrete corrosion in wastewater infrastructure costs over $1 billion/year. By advancing underpinning science and developing a novel concrete that innovatively inhibits corrosion-causing microbes, the project expects to extend service life, enhance structural integrity, and minimize maintenance cost and service disruption in wastewater infrastructure. Expected outcomes will contribute to sustainable and resilient next-generation wastewater infrastructure. This should provide significant economic, social and environmental benefits to Australia's water sector.	79,428.50	157,827.00	156,398.50	78,000.00	471,654.00
	National Interest Test Statement Australia's wastewater infrastructure has long grappled with concrete corrosion, resulting in substantial economic burden exceeding $1 billion annually and service disruptions. Moreover, a majority of Australia's existing wastewater facilities are approaching the end of their lifespan, requiring extensive replacement. Australia's water industries urgently need a corrosion-resistant concrete to establish resilient next-generation wastewater infrastructure. This project aims to create a corrosion-resistant concrete that innovatively inhibits corrosion-causing microbes by using cost-effective and eco-friendly admixtures. The project outcomes directly address the pressing needs and significant challenges faced by Australian water sectors. The findings can be translated into guidelines for designing and operating resilient wastewater infrastructure, aiming to extend service life while minimizing maintenance costs and service disruptions. This will assist Australia's water sector in achieving sustainable and resilient next-generation urban wastewater infrastructure and preventing inadvertent public exposure to wastewater-borne pollutants. Further, the outcomes can find a multi-billion-dollar global market, positioning Australia as a leader in corrosion control. This will enable the development of commercial products by Australian start-ups and advanced manufacturing companies, ultimately delivering tangible economic and environmental benefits to the entire Australian population.					
DE250100610 Carnemolla, A/Prof Phillippa K	**Delivering sustainable and quality aged care in home environments.** This project aims to investigate the role of housing in the delivery of quality, sustainable home care by exploring the perspectives of older people, aged care staff and aged care organisations. It expects to generate new knowledge about the relationship between care and built environments using techniques including walk-along interviews and surveys. Expected outcomes include an evidence base describing the relationship between care delivery (equity of access, effectiveness, safety and	78,082.00	156,651.00	155,739.00	77,170.00	467,642.00

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	sustainability) and housing features (housing type, design, tenure and condition). Outcomes are expected to provide significant benefits including building Australia's capacity to deliver quality home care and support a sustainable aged care workforce. **National Interest Test Statement** The unique and diverse types of homes people live in are the main setting for Australia's aged care delivery, whether that home be a free-standing house or apartment, privately owned or rented, old or new. Increasing demand for home care services for older Australians has resulted in care systems operating in unregulated environments and under increasing financial pressure. Despite evidence that housing (design, location and condition) plays a direct role in independence, quality of life, and reduced care need, this has not been fully explored in an aged care context. This relationship is worthy of exploring because homes are also workplaces for carers, and the project will lead to better quality care, job quality and address ways to retain quality carers in the workforce. Aligning with the National Aged Care Reform Agenda the project benefits Australia economically by maximising the value of Government investment in aged care. The project's translation of the findings for community, providers and policymakers will ensure that the research contributes to supporting the preference of Australians to receive care at home in their local community. It will also equip aged care providers with innovative approaches to delivering services safely, equitably and efficiently in Australian homes.					
DE250100730 Zheng, Dr Xiaobo	**Regulating Interfacial Chemistry for High-Energy Zinc-Air Batteries** This project aims to develop advanced zinc-air battery technology to address the growing demand for sustainable energy storage. The project is expected to generate advanced knowledge in the area of materials science and energy technology, and to advance the development of renewable zinc-air batteries. Expected outcomes of this project include the development of a cut-edge zinc anode protection scheme, innovative electrocatalyst design concepts and synthesis protocols, and enhanced capacity to build interdisciplinary collaborations. This should provide significant benefits, such as tackling Australia's energy crisis and cementing its global leadership in the field of energy storage. **National Interest Test Statement** Lithium-ion batteries are a greener alternative to fossil fuels, playing a critical role in storing energy generated by wind and solar power. However, they are costly to produce due to a limited supply of lithium, are prone to overheating (so raise safety concerns), and are unable to store a huge amount of energy. This project will develop a low-cost, high-energy, and safe zinc-air battery alternative to substitute for lithium-ion as the next-generation energy technology. The outcomes of this project will advance our understanding of zinc-air batteries and contribute to the development of greener, energy storage systems. This will position Australia as a global leader in renewable energy and support our national plan to achieve net-zero carbon emissions by 2050. Through workshops and reports presented during industry roadshows, this project will equip Australia's energy sector with the essential information needed to comprehend and implement this cutting-edge technology.	81,388.50	162,777.00	162,452.00	81,063.50	487,681.00
DE250100883 Girsberger, Dr Esther Mirjam	**Labour market expectations, job search and migration of young graduates** Graduate unemployment is widespread in low-income countries and a policy priority for African and Asian governments. This project aims to ascertain why high school and university graduates face high unemployment rates in Cote d'Ivoire. It expects to generate new knowledge on graduates' labour market expectations and their job search, by creating the region's first comprehensive dataset on graduate jobseekers as well as two novel theoretical frameworks for evaluating root causes of unemployment. Expected outcomes include policy advice that will reduce unemployment, providing significant benefits for young Ivoirians and the economy, while also stemming the jobs-related migration that is causing a brain drain at home and problems in Europe. **National Interest Test Statement** Educational attainment has risen in Sub-Saharan Africa over recent decades, but remains the world's lowest. Development assistance for education is often motivated by improving labour market opportunities and earnings for youth. Australia provides over $80m annually in official development assistance to Sub-Saharan Africa, of which about 40% is invested in education. However, this well-intentioned support contrasts sharply with the phenomenon of high graduate unemployment observed in the region, where graduates take months, or even years, to find stable work. This project, focused on Côte d'Ivoire, will contribute to ensuring that Australia's development assistance spending is sustainable, economically viable and relevant, by addressing a gap in knowledge as to why educational qualifications do not necessarily translate into jobs. This investigation into the root causes of graduate unemployment and its consequences for international migration will directly shape policy advice to assist governments in the region and international institutions seeking to address graduate unemployment. The project outcomes will be disseminated to stakeholders such as DFAT, African Development Bank, World Bank, International Labor Organisation, and others. It can help Australia re-evaluate its allocation of development assistance and will also contribute to Australia's efforts towards UN Sustainable Development Goal (SDG) 4: Quality education, and SDG 8: Decent Work and Economic Growth.	73,228.50	149,677.00	148,762.50	72,314.00	443,982.00
DE250101503	**Measure subcellular structure changes with axial super resolution**	81,388.50	162,777.00	162,777.00	81,388.50	488,331.00

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Gu, Dr Yuyang	This project aims to provide a facile approach to axial super-resolution, assisted by a metasurface. This scheme will provide a generalized strategy for quantitatively measuring sub-diffraction limit conformational changes in live cells, as demonstrated through the measurement of immune response in macrophages. With simultaneous control of surface morphology at the nanoscale, this project will generate new knowledge for the design of an optically responsive metasurface that is highly sensitive to distance and topography. Expected outcomes include a universal platform for the precise study of membrane conformation, mechanosensing, and cell migration, making substantial contributions to the progress of cell biological research.					
	National Interest Test Statement Macrophages are a type of immune cell that play a key role in the immune system as the first line of defence against pathogens and infections. However, how they function in the immune response is not fully understood. Understanding the process of macrophage endocytosis - a regulated process of engulfing extracellular materials used by macrophages to initiate their immune and inflammatory responses - can revolutionise our approach to immune modulation, therapeutic interventions, and drug development. The project, which aims to develop and utilize cutting-edge super-resolution microscopy technology to visualize the immune response in macrophage cells, holds long-term significance for Australia's national interests. By enabling a more quantitative understanding of immune mechanisms, this technological advancement is expected to subsequently enhance survival rates and health outcomes for immune-related diseases across the country. The insights and methodologies of this project are exclusive to our laboratory and help to quantify and measure conformational changes in macrophage cells at levels of detail that are not currently achievable. This is crucial for understanding how the immune response is stimulated and develops. The project results can be further used to guide the development of analytical platforms with diverse applications in food safety, environmental sciences and agriculture, contributing to the development of next-generation imaging and bioassay technologies.					
	University of Technology Sydney	698,255.00	1,387,362.00	1,372,379.50	683,272.50	4,141,269.00
University of Wollongong						
DE250100051 Mavilidi, Dr Myrto F	**"Screening" digital active learning for young children.** Young children spend more time than recommended on sedentary screen time. This project aims to discover how high quality digital activity can support children's learning and development. The project will generate new knowledge by creating a conceptual framework that integrates digital learning, training of self-control and movement. Expected outcomes include a robust screen time quality assessment tool for parents and educators and an exemplar program. Application of the outcomes will improve digital learning, self-control and physical skills of young children. Parents and practitioners will be able to choose online resources that best support children's development. The outcomes will also guide the design of better technology for children.	81,323.50	162,628.00	162,663.50	81,359.00	487,974.00
	National Interest Test Statement This project will benefit all children, in particular those disadvantaged, and their carers, providing higher quality digital experiences during screen time, creating new opportunities for teaching and learning. The proposed approach will give children the opportunity of active and sustained engagement in digital learning, with activities aiming to train cognitive, self-control, and physical outcomes. The construction of a high-quality evidence-based assessment tool for digital learning resources will inform the improvement of existing and development of new resources. It will also inform educational technology designers on how to design digital learning resources addressing children's developmental milestones, and early childhood educators on what learning materials to bring in their classrooms. It will help parents make good decisions about the content of the digital learning resources suitable for their children. The quality assessment tool will be a parent- and educator-friendly online questionnaire with scoring system against criteria linked to child developmental outcomes. The tool and videos with practical guidance and instructions on how to use it will be free for public use, issued through open-access resources, allowing for broad dissemination of results across Australia. Community events (e.g., online and recorded seminars, and workshop presentations for parents and educators, family events organised at University of Wollongong), will reach beneficiaries directly.					
DE250100190 Deng, Dr Lei	**Quasi-active vibration control of seat suspension to improve ride comfort** This project aims to improve the ride comfort of vehicles by developing a quasi-active seat suspension, which outperforms passive, semi-active and active seat suspensions in vibration reduction performance, system simplicity, energy consumption, stability and fail-safety. The expected outcomes of this project include the theory development of quasi-active control using smart materials and structures, a prototyped quasi-active seat suspension, and experimental evaluation of the seat suspension. The benefits of this project will promote the research of quasi-active control, and	78,778.50	142,727.00	127,897.00	63,948.50	413,351.00

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	improve the working conditions and protect the health of vehicle occupants who suffer long-term vibrations, such as truck and heavy-duty vehicle drivers. **National Interest Test Statement** Seat suspensions play a key role in reducing the vibration transmitted from the vehicle body to the occupants. Seat vibration can cause fatigue and physical discomfort, which reduces the ride comfort. Long-term exposure to excessive seat vibrations can contribute to health problems, including musculoskeletal issues, such as back pain and joint discomfort. It can even cause occupational health risks, particularly for professional drivers of trucks, mining machines and other heavy-duty vehicles. This research program aims to reduce the vibration of seat suspension and improve ride comfort by developing a quasi-active seat suspension. The proposed seat suspension fills the gap between active and semi-active seat suspensions, and it possesses advantages over them in terms of structural complexity, energy consumption, cost-effectiveness, etc. The project is expected to reduce the health issues caused by seat vibrations and accidents caused by fatigue and discomfort. Australian automotive component manufacturers can benefit from this project by commercialising the quasi-active seat suspensions. They can also gain profits by exporting knowledge, products, and services to the international market, boosting the national economy.					
DE250100232 Li, Dr Xiaoning	**Boosting Spin-Sensitive Redox by Tuning Chirality** This project aims to develop effective spin engineering strategies to boost electron transfer in spin-sensitive redox, by fabricating linear and chiral magnetic structures, as well as applying magnetic fields into the system. It is expected to overcome the obstacle of slow electron transfer through innovative spin engineering. Taking oxygen evolution reaction as a demonstration, a pivotal step in green hydrogen production and metal-air battery, the anticipated outcomes will shed light on the intricate interplay between electron spin and redox efficiency, ultimately paving the way for the development of advanced catalysts for green energy. **National Interest Test Statement** This research makes a significant contribution to Australia's national interests by tackling critical energy and environmental challenges. Specifically, it addresses the fundamental obstacles in redox reactions from a physical perspective, which are crucial for sustainable energy solutions. The inefficiency of electrocatalytic redox, due to its spin-sensitive nature, has impeded the progress of green hydrogen production and metal-air batteries. Our project focuses on creating linear and chiral magnetic structures and harnessing magnetic fields to pioneer innovative spin engineering strategies. By delving into the interplay between electron spin and catalysis, we have the potential to drive innovation and enhance Australia's competitiveness in the global clean energy sector. This research extends its impact beyond national borders, paving the way for a sustainable, eco-friendly future not only for Australia but for the entire world. To ensure a widespread impact, we are dedicated to sharing our findings widely and collaborating with industry, policymakers, and the public, fostering the adoption and practical application of our research outcomes.	81,438.00	162,776.00	162,776.50	81,438.50	488,429.00
DE250101041 Yang, Dr Rupeng	**Expanding the Frontiers of Provably Secure Watermarking** This project aims to bridge the gap between previous studies on provably secure watermarking and its real-world applications. Since watermarking techniques are widely used in practice, it is hoped that they can be used to detect the output of artificial intelligence (AI) algorithms. However, existing solutions from academia do not match the practical requirements. The expected outcomes of this project include novel concepts and methods for constructing watermarking schemes that will support a wider class of watermarking targets, have better security guarantees, and use less resources. This will narrow the gap between theory and practice in the field, reduce AI-assisted cyberattacks, and help to safeguard cybersecurity for all Australians. **National Interest Test Statement** Cybercriminals are profiting from artificial intelligence (AI) breakthroughs where hackers can use AI algorithms to mimic a person’s voice and use that to bypass voice-recognition authentications. Unfortunately, the authentication system used by the Australian Taxation Office and Centrelink are also vulnerable to these attacks, which puts our money and privacy at risk. To solve this current problem, this project aims to develop novel watermarking techniques that will prevent such attacks. Watermarking techniques enable the content generated by AI algorithms to be identified if they are used properly by all AI service providers. Such a regulation was recently proposed by the US government, but at this stage it is not known how to implement it due to the large gap between existing studies on watermarking and practical requirements. This project will present techniques that close the gap and construct watermarking schemes that are ready for the above applications. Through collaborations with government bodies and tech giants, this project will promote the adoption of our techniques in current AI algorithms. This could protect the authentication systems used by Australian government services from AI-based cyberattacks and also benefit all Australians by safeguarding their money and privacy. This project is a significant opportunity for Australia to lead the field in preventing AI-related cybercrimes, which means it aligns well with Australia’s Cyber Security Strategy.	79,088.50	159,827.00	160,627.00	79,888.50	479,431.00
	University of Wollongong	320,628.50	627,958.00	613,964.00	306,634.50	1,869,185.00

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Western Sydney University						
DE250100560	**Thermoelectric Building Modules: Turning Urban Heat into Energy**	80,548.50	160,852.00	156,757.00	76,453.50	474,611.00
Cai, A/Prof Jingming	This project aims to create high-efficiency thermoelectric building modules for thermal energy harvesting. This initiative is poised to bring forth new knowledge in the development and application of thermoelectric materials for construction. The anticipated outcomes include understanding the thermoelectric mechanisms of building materials caused by temperature differences, refining design methodologies, and enhancing application techniques for such materials. This will help to significantly decrease the energy consumption of buildings and alleviate the urban heat island effect, presenting substantial benefits for the nation's urban and built environments.					
	National Interest Test Statement					
	This project is a world-first systematic study of thermoelectric (TE) building modules that convert thermal energy to electricity, addressing Australia's escalating climate challenges (including excessive urban heat) and advancing technology for Zero-energy buildings – buildings with net zero energy consumption. Although TE technology has been successfully applied in various fields such as microelectronics, aerospace, and medicine, it has not been used much in the building sector, due to high costs and insufficient durability. This project will develop TE building modules that will have high TE efficiency, mechanical performance, and durability characteristics. The TE building modules designed here will repurpose urban heat into electrical energy. This not only helps alleviate the ‘urban heat island’ effect but also reduces reliance on fossil fuels, offering significant economic and environmental value. By integrating these modules, buildings can change from passive energy consumers to active energy providers, becoming energy-harvesting buildings. Aligning with Australia's needs for high value-added materials and clean energy, this project promises substantial commercial returns and societal benefits.					
DE250100704	**Decoding the spectral signatures of Australia’s tree diversity and function**	80,584.50	161,656.00	146,332.50	65,261.00	453,834.00
Williams, Dr Laura J	This project aims to decipher eucalypt tree diversity and function through the lens of hyperspectral ecology. By combining leaf spectral analysis for hundreds of species with phylogenetic and process-based modelling, the research seeks to reveal how the remarkable diversity of eucalypts has arisen and what it means for ecosystem function. The project will generate a new mechanistic understanding of tree diversity and its consequences for the healthy functioning of ecosystems in Australia. This will enhance our capacity to manage Australia’s eucalypt-dominated ecosystems and design revegetation efforts, providing significant benefits toward mitigating climate change and conserving biodiversity.					
	National Interest Test Statement					
	Australia’s forests and woodlands are vital in shaping our climate and the quality of air we breathe and water we drink. Reforestation using native species is also one of a suite of approaches to meeting our national net zero targets. A comprehensive understanding of how Australia’s trees vary and how they function together as forests is therefore essential to inform their management. Recent research shows that light reflected by plant leaves, as recorded by optical sensors, may act like fingerprints, allowing us to identify plants and assess how they function. This project will capture and decode these detailed spectral fingerprints for one of Australia’s most important group of trees: the eucalypts. By linking these spectral fingerprints to rich field data and analysis platforms, this project aims to reveal how co-occurring eucalypt trees vary in their function and what this variation means for the resilience and productivity of our eucalypt trees and forests—both now and into the future. The outcomes of this research will be shared broadly with land managers and will serve to improve our capacity to remotely sense plant biodiversity, inform nature repair markets, and enhance nature-based solutions to climate change.					
DE250101479	**Mapping the Development of Emotional Reactivity in Childhood**	81,372.00	162,794.00	162,794.00	81,372.00	488,332.00
Doyle, Dr Frances L	This project aims to discover how emotional reactivity develops in early childhood. Using psychological and physiological assessment techniques, the research will advance our understanding of the role of child and parental emotional reactivity in the development of empathy and aggression in childhood. Expected outcomes include novel evidence about when and how emotional reactivity may contribute to risk for adverse child outcomes. Benefits include earlier detection and intervention of risk factors for childhood mental health problems, which can significantly alter developmental trajectories for children and their families, in ways that are socially and economically beneficial for communities.					
	National Interest Test Statement					

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	In Australia, mental and behavioural disorders have the fourth greatest ‘area of disease’ burden. Moreover, mental health is a National Health Priority Area. Even gold-standard interventions for child mental health problems only result in clinically significant change for about 50% of children. Research shows that intervention outcomes can be predicted by emotional reactivity – i.e., the internal physiological arousal experienced as part of an emotional response. To create better interventions, it is critical that the development of emotional reactivity is mapped in childhood. This project aims to understand the typical development of emotional reactivity, and how emotional reactivity relates to child outcomes, such as empathy and aggression. Moreover, as extensive research shows the important role of parents in optimising child outcomes, the influencing role of parental emotional reactivity will be examined. Findings from this research will further refine models of child development, and the relationship between emotional reactivity and functioning. This will help to develop more precise early detection and intervention targets. Early detection and intervention for childhood mental health disorders has the potential to alter adverse developmental trajectories in ways that are clinically significant for children and their families, as well as socially and economically beneficial for communities.					
Western Sydney University		242,505.00	485,302.00	465,883.50	223,086.50	1,416,777.00
New South Wales		4,312,290.50	8,595,802.50	8,519,086.00	4,235,574.00	25,662,753.00

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Queensland						
Central Queensland University						
DE250101169	**Improving shiftworkers sleep and physical activity using machine learning.**	81,448.00	162,842.00	162,841.50	81,447.50	488,579.00
Vincent, Dr Grace E	This project aims to develop a smartphone-enabled digital assistant to optimise sleep and physical activity for Australians working non-standard hours, resulting in critical benefits for workplace productivity and safety. By harnessing advanced machine learning techniques and integrating wearable technology, this project aims to cater specifically to the unpredictable and variable hours of shiftworkers, on-call workers, and gig workers - something current tools do not. The expected outcome is a scalable digital assistant that provides personalised sleep and physical activity advice based on individual work patterns. This project is designed to provide new knowledge on personalised behavioural interventions using machine learning.					
	National Interest Test Statement Productivity losses linked to inadequate sleep and physical inactivity are estimated to cost Australia more than $31 billion annually. Inadequate sleep and physical inactivity are most pronounced among the 3.5 million Australians working non-standard work schedules, including shift work, on-call duties, and gig economy roles. My research will utilise machine learning tools and wearable technology to create a cutting-edge personalised digital assistant within a smartphone application. This will enable users to optimise their sleep and physical activity according to their work and non-work schedules. Economic and social benefits include more productive and safer workplaces, and this project presents commercial opportunities to adopt this scalable digital assistant across multiple industries. Outcomes will be communicated through academic and industry publications and direct community outreach including media, industry forums and public science events.					
	Central Queensland University	81,448.00	162,842.00	162,841.50	81,447.50	488,579.00
Griffith University						
DE250100013	**Sustainably feeding the world: the potential of climate-adaptive fisheries**	77,639.50	152,028.00	151,707.00	77,318.50	458,693.00
Heneghan, Dr Ryan F	This project aims to uncover the ability of climate-adaptive fisheries management to counteract climate change impacts on the world's marine ecosystems. Existing global marine ecosystem models lack the speed and certainty to robustly explore this potential, meaning a step-change approach is needed. Leveraging advanced mathematical and statistical methods, this project will develop new tools to deploy global models for strategic, long-term marine ecosystem management. The outputs will allow rapid and accurate long-term planning for sustainable use of the world’s shifting marine resources under climate change. Benefits include advances in climate-adaptive fisheries management to sustainably feed the world’s growing population.					
	National Interest Test Statement Feeding 10 billion people by 2050 will require increasing reliance on a sustainable supply of food from the sea. Yet, the world’s ocean ecosystems are already experiencing growing, immense pressure from the effects of both climate change and fishing, jeopardising future food supplies as crucial ecosystems suffer and fail. New approaches to managing these interacting, global-scale stressors are urgently needed. This project will explore the potential of climate-adaptive fisheries management to address this challenge, delivering advanced tools for intelligent, strategic management approaches that adapt fisheries planning to counteract the impacts of climate change on fish production. By uncovering the potential of climate-adaptive fisheries, this project will better enable Australia—and countries in our region most susceptible to climate change—to sustainably plan their future food security, supporting Australia’s role as a leader in marine management practice across the Asia-Pacific. Novel modelling tools will be developed in close collaboration with national (CSIRO) and international (United Nations Food and Agriculture Organisation) end-users, ensuring rapid translation of the outputs to real-world practice. The project's research outcomes will deliver benefits to Australia and globally by better ensuring food security and the long-term sustainability of Australian and international fisheries in an era of global change.					
DE250100132	**Quantum Dot Hybrids for Methanol Photoreforming**	75,638.50	153,977.00	156,397.00	78,058.50	464,071.00
Chen, Dr Dechao	This project aims to develop heavy-metal-free quantum dots hybrid materials for solar-driven reforming of methanol into high-value chemicals accompanied with carbon emissions-free, zero-					

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	pollution hydrogen production. The project expects to contribute new knowledge in the colloidal synthesis of quantum materials by overcoming the challenges of organic-inorganic synthesis barriers and providing platform technologies for handling highly efficient photocatalysts. This project will address the critical challenges in methanol photoreforming, and significantly contribute to Australia's sustainable hydrogen industry and value-adding export economy. **National Interest Test Statement** Australia produces over 130 megatonnes of biomass waste per year, mostly burned or wasted, causing major negative environmental impacts. Converting biomass waste methanol into clean fuel, and also value-added chemicals for use in such industries as animal feedstock production, is the holy grail for a carbon-neutral economy. This project aims to develop novel photocatalysts to assist solar-driven conversion of biomass waste methanol into these value-added chemicals while also producing green hydrogen. The development of novel photocatalysts using novel quantum dot hybrid materials will increase our ability to drive reactions that do not occur under conventional reaction conditions. Communication of research outcomes and outputs will be done through peer-reviewed journal publications, media news and conferences. The aim is to ultimately contribute to the generation of a new methanol-to-plastics industry, in addition to large-scale green hydrogen production. This project will advance Australia as a key global player in green hydrogen and advanced manufacturing simultaneously, while protecting the environment, by stimulating the green methanol industry, and creating new manufacturing capabilities in catalyst design and production, and circular economies.					
DE250100317 WANG, Dr LIANG	**Single-Atom Electrode for Hydrogenation Reactions at High Current Densities** This project aims to develop a new type of single-atom electrodes for electro-catalytic hydrogenation to produce value-added products at industrial-scale current densities. A single-atom tailoring strategy together with precise control of the electrode micro-architectures will be applied to maximise device performance. The expected outcomes include the establishment of basic rules on the fabrication of high-efficiency single-atom electrodes and a fundamental understanding of the relationships between the morphological properties of single-atom sites and catalytic activities. The project secures Australia's leading position in materials science and renewable energy, bringing economic benefit through the commercialisation of novel electrodes. **National Interest Test Statement** Hydrogenation is a process of adding hydrogen to organic substances to make useful products, such as fuel additives and value-added chemicals. However, current methods of hydrogenation require harsh reaction conditions, which are slow, costly, and harmful to the environment. This project aims to develop a new type of single-atom electrodes for electro-catalytic hydrogenation, which can speed up reactions under ambient conditions and reduce energy consumption and pollution. The project will also study how the morphological features of single-atom catalysts affect the performance and durability of these electrodes. The project outcomes will include novel and efficient single-atom electrodes for hydrogenation reactions, as well as new insights into the mechanisms of these reactions. The project will benefit Australia by advancing the science and technology of hydrogenation, creating new opportunities for the energy and chemical industries, and contributing to a cleaner and greener future. The project will also promote the research outcomes to the public and potential users through various media and partnerships.	73,948.50	143,897.00	139,897.00	69,948.50	427,691.00
DE250100380 Wilkin, Dr Shevan	**Ochre as a preservation reservoir for archaeological biomolecules** The use of ochre in ancient artwork and adornments is widespread. As ochre is metal oxide-rich, its antimicrobial properties act as a preservative agent for intermixed organic binding agents. This project, through proteomic analysis of ochre-laden residues on archaeological materials, will explore the plant or animal products used to facilitate ochre use in the past. Proteins can illuminate the tissues (blood, milk, saliva) mixed with ochre, allowing insights into ancient human-animal-plant interactions. The completion of this project will: 1) clearly demonstrate the viability of ochre-based residues as a reservoir for biomolecules, and 2) provide insights into primary and secondary products from wild and domesticated species in the past. **National Interest Test Statement** Ochre, a natural earth pigment, has been used for millennia by modern and archaeological populations in Africa and Australia for artistic, symbolic, and functional purposes. In order to transform ochre into paint, cosmetics, or medications it must be mixed with organic binders that derive from natural materials. Uncovering evidence of how past people used natural resources with ochre can lend insights into Aboriginal lifeways in Australia and abroad. This project will analyse proteins contained within these binders, uncovering which types of plant or animal products (oil, milk, blood) were relied upon by past peoples across the Global South. This project will combine the expertise of archaeologists, scientists, and Indigenous communities to acquire and contextualise this knowledge. The methodology used in the project will provide an experimental framework that can be applied to archaeological collections worldwide. Apart from publishing the results in open access, peer-reviewed journals, both laboratory and data analysis methods will be made freely available through online services such as protocols.io, Mendeley, and Github. This DECRA project, using novel and ground-breaking methodologies in biomolecular archaeology at Griffith University will bring global attention to Australia as a leader in archaeological	80,673.50	161,572.00	161,797.00	80,898.50	484,941.00

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	science.					
DE250100397	**On the hardship that is homelessness**	75,336.50	150,673.00	150,673.00	75,336.50	452,019.00
Ambrey, Dr Christopher L	Homelessness is a global human rights violation and exists, even among States that have adequate resources to remedy it. This study builds on earlier research efforts to investigate: (1) how people fall into and climb out of homelessness; (2) the consequences homelessness has for wellbeing; and (3) how these consequences evolve the longer individuals are homeless. This study is expected to generate new knowledge in our understanding of homelessness by employing underutilised longitudinal data; coupled with sophisticated nonlinear panel data techniques. Ultimately, real service practice and policy changes, informed by theory and based in evidence, are expected to improve the lives of people at-risk of, or experiencing homelessness.					
	National Interest Test Statement					
	The Australian Bureau of Statistics estimates that 122,494 people were homeless on Census night. Further, in Australia, total government recurrent expenditure for social housing and specialist homelessness services was $5.9 billion in 202122. Despite the scale of homelessness and current expenditure, there is a dearth of rigorous quantitative evidence on pathways into and out of homelessness, the consequences of homelessness for one's wellbeing and how these consequences evolve the longer one is homeless. This study examines how these patterns depend on support services, with a complementary focus of this study being on; people between 12 and 24 years of age; and people aged 55 years and over; priority cohorts for the nation. In so doing, this study serves to fill a crucial knowledge gap. Through embedding researchers in the sector, on the ground, developing researchers and facilitating the iterative co-creation of research questions with decision makers this study will; not simply disseminate findings widely, beyond academia (e.g., to staff, volunteers, end users and the public), but also to translate these findings into real practical solutions. These changes are expected to manifest themselves in the form of concrete changes to welfare services delivered (e.g., housing, tenancy, financial, emergency relief, legal aid and family violence services). In this way, this study aims improve the lives of people at-risk of or experiencing homelessness.					
DE250100597	**Universal Jurisdiction for International Crimes in the Asia-Pacific**	80,766.00	162,214.00	161,295.50	79,847.50	484,123.00
Palmer, Dr Emma L	This project aims to investigate how universal jurisdiction is used to prosecute atrocities in the Asia-Pacific. Advancing international relations theories about how norms are adapted in different contexts, it expects to generate new knowledge about how universal jurisdiction can be applied to prosecute crimes against humanity, war crimes, and genocide in domestic courts – regardless of where the violence occurred, or the perpetrator or victims' nationalities. Expected outcomes include an evidence base for improved decision-making and collaborations for practitioners and officials investigating and prosecuting international crimes in the Asia-Pacific. Benefits include improved access to justice and enhanced responses to atrocity crimes.					
	National Interest Test Statement					
	Universal jurisdiction can be used in domestic courts to prosecute serious crimes that happened overseas, by perpetrators from other countries. It is used in many countries to prosecute war crimes and other atrocities, but rarely in the Asia-Pacific, including Australia, even when alleged perpetrators travel here. Prosecuting serious human rights violations can support justice and strong institutions to build sustainable peace as reflected in Goal 16 of the United Nations Sustainable Development Goals. Australia is a long-term significant supporter of international criminal courts that prosecute atrocity crimes, but they have limited resourcing and jurisdiction. This project will support regional responses to atrocities and help ensure that Australia and our neighbours do not become a haven for perpetrators, by analysing when and how universal jurisdiction could be used in, and for crimes committed within, the Asia-Pacific. This will provide an evidence base that will be translated into a collaborative website and practical guidance documents, to help investigators, prosecutors, human rights advocates, and policy makers respond to serious human rights violations, wherever they occur. The project will support Australia's contribution to the Sustainable Development Goals and regional leadership in promoting research-driven responses to atrocities.					
DE250100762	**Understanding and control of quantum nonlocality in complex scenarios.**	80,391.50	151,424.00	142,136.00	71,103.50	445,055.00
Polino, Dr Emanuele	The future quantum internet and cybersecurity are dependent on quantum nonlocality, referring to the strong correlations between distant quantum physical systems. Nonlocality has been studied mostly in two-party scenarios. This project aims to understand and realize multiparty scenarios. It expects to create significant new knowledge on complex quantum networks, generating new nonlocality forms. Anticipated outcomes include innovative quantum optics protocols and causal inference techniques enabling quantum nonlocality in diverse networks, opening new paths for quantum technology. Expected benefits will impact the future quantum internet with the ultimate cybersecurity for transferring economic, personal, health, and government data.					

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
	National Interest Test Statement Cybersecurity is a crucial concern for Australians, particularly in light of recent mass data breaches. Quantum mechanics can offer the ultimate level of security and privacy. This is possible thanks to the phenomenon called "quantum nonlocality", which involves strong connections between distant systems and beyond those in classical physics. This enables us to communicate securely without needing to trust the devices we use to communicate. To tap into this incredible potential, an important gap needs to be addressed. Most research on quantum nonlocality has focused on simple scenarios with a few systems. However, the future internet, whose security will be based on quantum technologies, will require the connection of multiple stations distributed in complex networks. This project aims to fill that gap and demonstrate, for the first time, how quantum nonlocality works and emerges in novel complex photonic networks. The developed methods will be crucial for making Australia's communications intrinsically secure and will help to propel Australia to the forefront of quantum science. The results will be shared with the Australian scientific and industrial communities through open-access platforms. Project outcomes could be commercialized by patents obtained from results and subsequent licensing to the industry.					
DE250100772 Huang, Dr Jianyin	**Major hidden source of land-based nutrients affecting Australian estuaries** The project aims to investigate a previously undiscovered driver of declining water quality in Australian rivers and estuaries, namely organic and particulate nutrients. Innovative research approaches, which combine chemical characterisation, measures of ecosystem response and machine learning, will be used to unpack the complex behaviours of particulate matter in delivering a significant source of bioavailable nutrients affecting waterways. The insights of this project will enhance model predictions of water quality and inform catchment management approaches. The benefits include cleaner water, healthier estuarine habitats, more robust fishing and tourism industries, and protection of important sites such as the Great Barrier Reef.	79,283.50	158,657.00	159,682.00	80,308.50	477,931.00
	National Interest Test Statement Coastal habitats in Australia, which are crucial for their ecological, economic, and cultural values, are under threat from land-derived runoff pollution. Significant effort is being directed to reduction of land-based nutrient runoff, particularly in regions such as Australia’s UNESCO World Heritage site, the Great Barrier Reef. However, recent research has brought to light a previously undiscovered source of nutrient pollution currently not represented in models which inform intervention actions. There is new evidence that organic and particulate nutrients washed off the land are stimulating the growth of bacteria and algae, exacerbating water quality issues. This project will investigate this hidden source of nutrient pollution using state-of-the-art multidisciplinary techniques. The project will deliver crucial new insights, addressing an important knowledge gap in modelling, predicting and managing the impacts of runoff from the land to our coastal waters. Engaging directly with environmental managers and regulators to understand the characteristics and sources of these nutrients will ensure the new knowledge generated is directly transferable to decision-making, improving catchment rehabilitation and vegetation management strategies. The benefits will include cleaner water, healthier estuaries, more robust fishing and tourism industries, and protection of Australia’s important cultural and environmental assets.					
DE250100901 Kirk, Dr Jessica	**Improving the global management of health (mis)information** This project aims to investigate how health mis/disinformation is managed globally and assess which kinds of governance initiatives are most effective in addressing this problem. Through an in-depth comparison of four global initiatives, this project expects to answer current research gaps concerning the best practices, challenges, and barriers in addressing health mis/disinformation globally, as well as further our understanding of how contemporary global governance operates. The expected outcome of this project is an evidence base to enhance and develop global responses to health mis/disinformation. This should provide significant benefit to Australia’s efforts to improve regional and global health security.	63,683.00	129,122.50	136,831.50	71,392.00	401,029.00
	National Interest Test Statement Health misinformation and disinformation have long plagued responses to health emergencies, undermining efforts to test, treat and vaccinate populations to bring dangerous outbreaks under control. The Australian government recognises this problem and has sought to tackle it through both domestic regulation and regional initiatives, but such mis/disinformation is notoriously difficult for governments to manage. The growth of social media has only made this more difficult, with mis/disinformation spread easily and rapidly via the internet and out of reach for national authorities. Global responses – and our engagement with them – are necessary. While several global initiatives exist to tackle health mis/disinformation, we know little about how these initiatives work, how effective they are and where Australia’s engagement should be focused. This project will rectify this gap by investigating and evaluating four prominent global initiatives to address health mis/disinformation, providing insight into what kinds of initiatives best address health mis/disinformation, what challenges they face, and what best practice looks like. In sharing this knowledge with key government departments and civil society through reports and workshops, this project will aid Australia’s ongoing efforts to manage health mis/disinformation domestically and regionally, strengthening our health security before the next disease outbreak.					
DE250101258 Shi, Dr Yun	**Molecular Functions of Nicotinamide Adenine Dinucleotide Metabolites** This project aims to investigate the functions of metabolites from the breakdown of nicotinamide	78,948.50	160,397.00	162,897.00	81,448.50	483,691.00

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	adenine dinucleotide (NAD+), an essential molecule for all cellular life forms. These metabolites are likely to play important biological roles in bacteria, plants, and animals, especially in their immune systems. This project expects to determine the structure and function of these metabolites at the molecular level, filling a critical knowledge gap in NAD+-mediated signalling processes. Expected outcomes of this project include advanced knowledge of NAD+-mediated signalling and innate immunity pathways. This should provide significant commercial and economic benefits via the development of technologies against pathogens in plants and animals. **National Interest Test Statement** Crop production and livestock farming are important parts of Australian agriculture that provide food security for Australians, with Australian crop industries producing over $10 billion worth of crops each year and the livestock industry valued at over $69 billion per year. Both are susceptible to infections by pathogens such as bacteria that can impact food production. This project addresses an important research gap in our understanding of the functions of novel metabolites in bacteria and plant immune pathways at the molecular level. Advanced molecular knowledge in such plant immune systems can be used to improve pathogen resistance and antibiotics in valuable agricultural markets. This is expected to have significant economic benefits for Australian agricultural and biotech sectors that include enabling future engineering of crops with enhanced immunity against pathogen infections and development of new veterinary antibiotics against bacterial infections in livestock. Research outcomes will be promoted to potential industry partners via seminars, workshops, and commercial partnerships, with existing business development protocols at Griffith University, to maximise understanding and translation of the research outcomes.					
	Griffith University	766,309.00	1,523,961.50	1,523,313.00	765,660.50	4,579,244.00
James Cook University						
DE250101047 Siqueira Correa, Dr Alexandre	**Using past climate change to predict future reef productivity** This project aims to understand how coral reefs can sustain their high fish productivity into the future given the immediate threats of climate change. By examining ancient reefs using fossils and molecular evidence, this project expects to generate new knowledge about how historical fish productivity responded to changes in past temperature and reef condition. This knowledge will be used to predict the areas most affected by future changes in reef fish yields. These outcomes should provide significant benefits for the sustainable management of coral reefs, boosting Australia's position as a global leader in marine conservation. **National Interest Test Statement** Coral reefs hold immense economic and environmental value, contributing over $6.4 billion annually to the Australian economy, while globally supporting the nutrition of more than 400 million people. These critical values, especially those related to fisheries, are increasingly jeopardized by the escalating impacts of climate change. Global warming threatens coral reef fisheries in two key ways: it erodes reef structure by killing corals, and encourages small, fast-growing fishes. Both changes impact fish productivity, i.e. the creation of new flesh through fish growth. This project will look into the past using fossils and molecular evidence to understand how historical changes on reefs, and in the oceans, have altered fish productivity. The outcomes of this research will inform strategic management and conservation assessments at a national level by giving us an early warning of anticipated changes to fish productivity, benefiting Australians economically, socially, and environmentally. Promotion of this research will be achieved across a wide stakeholder group, simultaneously driving collaborative impact and ensuring diverse perspectives are incorporated in fisheries planning. The effective translation and adoption of these research findings will facilitate the long-term preservation of valuable marine ecosystems, their sustainable use, and the safeguarding of their socio-economic and cultural significance in Australia.	63,698.00	127,846.50	130,097.00	65,948.50	387,590.00
	James Cook University	63,698.00	127,846.50	130,097.00	65,948.50	387,590.00
Queensland University of Technology						
DE250100085 Wang, Dr Zhongzheng	**Enhancing residual trapping of CO2 during geological sequestration** The project aims to investigate CO2 trapping in porous media during cyclic CO2-water injection by developing an advanced pore-scale model for multiphase flow. Following validation using 3D-printed micromodels, simulations with a wide range of process parameters will identify conditions for maximum trapping. The project expects to generate new knowledge of the effects of fluid properties and flow conditions on CO2 trapping efficiency and a deeper understanding of how pore geometry	79,631.50	159,375.00	160,999.00	81,255.50	481,261.00

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	and spatial heterogeneity affect multiphase flow processes in porous media. The developed simulation technique and new knowledge will enable enhanced CO2 geologic storage efficiency and reduced risk of leakage and hence wider use of carbon geosequestration. **National Interest Test Statement** Australia is committed to combating climate change and is aiming to reach zero net carbon emissions by 2050. This project is focused on assisting Australia to achieve this by increasing the amount of carbon dioxide that can be permanently stored underground in porous rocks (carbon geosequestration). Australia's CO2 underground storage with current injection techniques is too low to meet the needs and projected to be only 10% of what is required. Alternatingly injecting water and CO2 shows promise to produce more stable CO2 storage. However realistic simulations of this process based on a deep understanding of fluid movement in porous rocks are needed to reliably select CO2-water injection operating conditions that maximise permanent CO2 storage. With a predicted market size for global carbon capture and storage of US$35 billion by 2032, efficient carbon geosequestration would be of economic as well as environmental benefit to Australia. Enhanced CO2 storage through the new process optimised in this project is critical to realise these benefits. In addition to using QUT's extensive network of collaborators to communicate project conclusions to government and industry, the new software will be made widely available through Github to stimulate widespread adoption of this process design technique.					
DE250100145 Li, Dr Meng	**Advancing meta-thermoelectrics through dual-channel phonon engineering** This project aims to develop dual-channel phonon engineering for decreasing thermal conductivity, which can not only deliver new knowledge in heat conduction and phonon transport theories, but also significantly advance meta-thermoelectrics. Expected outcomes include a scalable strategy to obtain thermoelectric materials with ultralow thermal conductivity which boosts the figure-of-merit to over 3.0, and enhanced capacity for modulating microscopic heat conduction that can be deployed in high-density and high-efficiency thermoelectric devices for autonomous power generation and miniaturised heat management. This project will benefit markets of personal electronics and hybrid vehicles and promote Australia's net zero emission target by 2050. **National Interest Test Statement** Thermoelectrics, being capable of converting low-quality heat to high value-added electric energy, play an important role on the roadmap of Australia's net zero emission. To increase the heat-to-electricity conversion efficiency, thermoelectric materials with low thermal conductivity are preferrable. Traditional viewpoint believes that decrease of thermal conductivity is mainly achieved by suppressing phonon (thermal energy carrier) transport in either propagative channel or diffusive channel. Inspired by recent pioneering studies, this project proposes an original dual-channel approach to simultaneously manipulate phonons in both propagative and diffusive channels. The proposed dual-channel phonon engineering will be validated in meta-thermoelectric materials, consisting of crystalline matrix and superionic minority phases that are semi-coherently combined, which expect drastic decrease of thermal conductivity and therefore figure-of-merit higher than 3.0. Meta-thermoelectric devices with energy conversion efficiency up to 18% can thus be assembled to serve for waste heat harvesting and ultrafast cooling techniques, ultimately reducing the combustion of non-renewable fossil fuels and improving energy accessibility globally. These research outcomes will be upscaled to place Australia at the forefront of energy conversion society and create employment for markets valuing over $200M in personal electronics, hybrid vehicles, 5G communication, etc.	76,798.50	152,097.00	150,597.00	75,298.50	454,791.00
DE250100396 Warne, Dr David J	**Sustainable Statistical Computing for Climate-Sensitive Science** This project aims to address the substantial carbon footprint of simulation-based statistical computations underpinning modern science. Current research focuses on reducing the time-to-result for computations at the expense of energy efficiency. Thus it is not currently possible to scale-up computations to address great environmental challenges without increased contribution to greenhouse gas emissions. Expected project outcomes are new simulation-based inference algorithms designed to be fast, accurate, and energy-efficient. Novel, readily available, low-power computer hardware will be used to demonstrate the future of low-energy statistical computing for climate-sensitive applications in health, environment and sustainability. **National Interest Test Statement** There is no doubt that computer algorithms and simulations are needed to tackle the defining challenge of our generation, the climate crisis. Unfortunately, the environmental impact of the necessary large-scale supercomputing is substantial in terms of carbon footprint and e-waste. Globally, computing produces more greenhouse gas emissions than the aviation industry. In Australia, our supercomputing facilities have four times the carbon footprint of equivalent systems in Europe or the United Kingdom. This project will develop highly efficient statistical analysis algorithms that can operate on readily available low-energy computing devices. This revolutionary change in computational methodology will enable priority climate-sensitive research in health, environment, and sustainability to be performed using computing resources that are themselves sustainable. This will accelerate Australia's progress toward Net Zero by 2050. User-friendly, free open-source software will be provided publicly, allowing the resulting algorithms and technology solutions to be widely available and accessible to any researcher wishing to reduce the carbon footprint of their computational research.	81,442.00	162,865.50	162,627.00	81,203.50	488,138.00

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DE250100536	**Sustainable Electrosynthesis of Urea and Formamide**	71,388.50	145,277.00	150,277.00	76,388.50	443,331.00
Liu, Dr Junxian	Urea and formamide are vital in modern agriculture, chemical industries, and pharmaceuticals, yet their current industrial production is unsustainable due to high energy and environmental costs. This project aims to design high-efficiency catalysts for electrochemical urea and formamide synthesis through theoretical simulations. The primary objective is to gain new insights into electrocatalysis by systematically exploring reaction mechanisms. Anticipated outcomes will develop optimal catalysts with high conversion efficiency and establish universal theoretical principles. This research will, in the long term, lead to increased production of crops and medicines, reduced costs in chemical industries, and improved environmental protection.					
	National Interest Test Statement					
	Urea and formamide are crucial raw materials in agriculture, serving as significant fertilizers and pesticides, respectively. Moreover, they find extensive use in both the chemical and pharmaceutical industries. As reported by the Australian Government's Department of Foreign Affairs and Trade, the import value for the categories of Fertilizers and Pharmaceuticals amounted to a substantial A$15 billion in 2022. However, the current industrial synthesis of urea and formamide relies on high-temperature and high-pressure processes, resulting in extensive energy consumption and greenhouse gas emissions. This project aims to address this challenge by designing highly efficient catalysts for the electrochemical synthesis of urea and formamide, along with developing viable strategies to enhance the yield of both compounds. The successful implementation will contribute to Australia’s sovereign capabilities in urea and formamide production by commercializing the technologies and intellectual property developed in this project. Through collaboration with experiments and industry, the anticipated outcomes hold the potential to yield significant long-term benefits for the economy and environment of Australia, and even on a global scale, including increased grain production, reduced costs of chemical and pharmaceutical products, as well as lowered energy expenses and exhaust emissions.					
DE250101094	**Characterising extracellular contractile injection systems in human gut**	80,948.50	162,042.00	159,542.00	78,448.50	480,981.00
Leu, Dr Andy O	Bacteria and archaea have a growing arsenal of characterised mechanisms they can deploy to compete with or control other organisms in the same environment. The goal of this DECRA will be to characterise a recently uncovered mechanism, where bacteria produce toxin filled ‘missiles’ that can be used to kill or modulate their competitors or host. Molecular and visualisation-based techniques will be applied to uncover the diversity, mechanisms, and targets of these novel microbial weapons in a model ecosystem, the human gut microbiome. This fundamental knowledge will be important for the development of customisable biocontrol agents with the potential to eliminate harmful microorganisms in a range of environments.					
	National Interest Test Statement					
	In most environments, there is an active battle between the constituent microorganisms, but our understanding of the mechanisms used in these competitive interactions with one another or their host remains limited. The recent discovery of bacterial-produced toxin-filled ‘missiles’ is a largely unexplored mechanism of microbial warfare that is found in a wide range of microorganisms. This project aims to understand the diversity of these weapons across all microbial life, with a particular focus on the human gut. This will greatly expand our understanding of this microbial warfare mechanism, which likely plays a substantial role in shaping their environment. In addition, these particles may be a prime candidate for use as a highly customisable biocontrol agent due to their ability to deliver diverse toxins to specific target cells. By understanding the function of these particles within microbial communities, this project will deliver a promising new avenue for targeting microbial pathogens, resulting in commercial, industrial, health and environmental benefits for Australia. The successful outcome and patenting will lead to commercial partnerships to ensure commercial benefits is realised in Australia.					
DE250101182	**Measuring and mitigating cumulative impacts in Antarctica**	81,239.00	162,298.50	160,348.00	79,288.50	483,174.00
Lee, Dr Jasmine R	This project aims to investigate human impacts in terrestrial Antarctica and determine how we can best protect its unique species into the future. Using novel modelling methods and field research, this project expects to transform our understanding of how local and global pressures accumulate and interact to impact Antarctic ecosystems. Expected outcomes include improved methods for assessing cumulative impacts and to generate the knowledge required by policymakers to maintain Australia's position as a world leader in Antarctic environmental protection. This should provide substantial benefits to policymakers in Australia and internationally, and to all Australians interested in conserving the world’s last great wilderness.					
	National Interest Test Statement					

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	Antarctica is the only continent on earth that is still considered largely untouched by humans. However, pressures such as tourism and climate change are growing and we don't understand if the impacts of these pressures accumulate through time, or whether they interact with one another to produce a combined impact larger than the sum of each pressure acting independently. Australia has long been regarded as a world leader in Antarctic conservation, and with a claim over more than 50% of the continent, our stewardship of the region is especially important. To maintain our environmental leadership, we must understand how to measure and mitigate cumulative impacts, a complex challenge for managing both Antarctic and Australian ecosystems. This project will both produce new methods for assessing cumulative impacts generally, and drastically improve our understanding of cumulative impacts in Antarctica. It will produce the evidence needed by policymakers to better manage Antarctica's unique species and environments in formats accessible to them. These outcomes directly align with the Australian Antarctic Strategy and 20-year Action Plan objective to protect the Antarctic environment. Ultimately, this project will help to conserve Antarctic ecosystems and ensure that Australia can continue to lead the way as Antarctica's primary protector.					
DE250101223 Kleshnina, Dr Maria	**Better environmental decisions amid strategic and evolutionary feedbacks** This project's main aim is to revolutionize conservation policymaking. By understanding eco-evolutionary feedbacks and strategic interactions among multiple stakeholders, results from this research will uncover strategies to effectively pursue biodiversity conservation. The ultimate goal of this DECRA is to understand how to anticipate and respond to complex evolving system dynamics, identify efficient mitigation strategies, and inform the multi-layered management of invasive species in Queensland. The resulting unified mathematical framework will help to identify key indicators in the system's behaviour, construct decision-support tools, and offer insights on the structure of viable actions available to the policymaker.	60,697.50	129,026.00	139,657.00	71,328.50	400,709.00
	National Interest Test Statement As a signatory to the UN 2030 Agenda for Sustainable Development, Australia has ambitious natural-resource-management goals. Inevitably, attainment of these goals will require detailed scientific assessment of which mathematical modelling is an essential component. There is an urgent need for a modelling framework enabling policymakers to anticipate change and steer entire ecosystems towards sustainability. Failure to meet that need will reduce meaningful mitigation and management policies to performing crisis-management tasks, as the natural system may exhibit rapid, unexpected, adaptations. Models developed thus far lack a unified approach accounting for natural systems' complex ecological and evolutionary responses, often providing conflicting forecasts. Hence it is essential to synchronise the processes of human development with those of the natural environment. Development of a unified framework will make policymaking proactive instead of being reactive. This initiative will place Australia at the forefront of sustainable policymaking benefiting and preserving its unique ecosystems. It will also serve as a proof-of-concept study intended to lead to subsequent technology transfer projects with organisations such as Biosecurity Queensland.					
DE250101447 Sutton, Dr Matthew W	**Scalable Bayesian inference for secure and reliable decision making** This project aims to develop the next generation of scalable Bayesian algorithms for fitting complex statistical models with big data. Existing scalable algorithms are either approximate or restricted to simple models with a small number of parameters. This can lead to unreliable data-informed decision making. Moreover, these methods are typically reliant on processing and storing big data at a central location which presents a higher risk to the privacy of the data. This project expects to significantly expand the set of problems where scalable Bayesian learning is practical and safe. This will lead to significant benefits for practitioners looking to make reliable decisions when working with big data.	81,023.50	162,282.00	159,587.00	78,328.50	481,221.00
	National Interest Test Statement Comprehensive data-based insights are essential to decision making. They are needed for reliable decisions in industry and government, with an example being that the government uses data on transmission to decide on policy during pandemics. For these types of problems, it is necessary to have timely insights and to ensure the privacy of the often sensitive data. This project will develop new algorithms to enable these desires without relying on simplifying assumptions about the phenomenon of interest. The new methods will deliver timely insights to enable decision making under uncertainty, while preserving the privacy of the data being processed. This comes at a particularly relevant time as Australian companies are experiencing massive data breaches that have compromised the privacy of citizens and caused massive financial losses. The outputs of the research will be promoted through open access software, international talks, and podcasting to ensure outcomes of the research program are adopted and translated into real benefits for Australia.					
	Queensland University of Technology	613,169.00	1,235,263.00	1,243,634.00	621,540.00	3,713,606.00
The University of Queensland						
DE250100612 Hannah, Dr Adam J	**Health workforce crisis: understanding political capacity for policy change** This project aims to investigate a chronic national and global crisis: critical shortages of health	72,142.00	151,101.50	148,858.00	69,898.50	442,000.00

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	workers. It expects to generate new knowledge of the political factors that constrain and enable health workforce policymaking, in Australia, Canada, England and New Zealand. It will utilise an innovative approach focusing on three forms of political capacity: communication, procedure and agenda management. Expected outcomes include new data on policy responses to the crisis and an improved understanding of the strategies and resources required for policy innovation and stakeholder collaboration. The project should benefit Australian health leaders and policymakers by providing recommendations on capacity building for future reform efforts.					
	National Interest Test Statement					
	Universal access to health care is being undermined by chronic shortages of health workers. Australia is not immune from the crisis – we are expected to face a shortage of 100,000 nurses and 10,000 general practitioners by 2031. While much of the public and expert debate focuses on the merits of specific solutions, such as recruitment of foreign workers or improved forecasting of workforce needs, the crisis is not caused by an absence of viable policy ideas. Often overlooked is the fact that policy change in health care requires leadership and, above all, political capacity – the ability to generate support for action, within government, among key stakeholders and the public. By analysing responses to the workforce crisis in Australia, Canada, England and New Zealand, this project will seek to identify communication and collaboration strategies that lead to more effective policymaking for sustainable workforces. It will also investigate the ways in which organisations representing doctors and nurses draw on the experiences of their members in helping to solve workforce shortages. The project is expected to create benefits for Australia's health system by generating recommendations for future reform efforts, particularly around the design of collaborative processes that can support policy change and innovation. Recommendations will be developed through workshops with policymakers and health leaders, and will be accessible via briefings, reports and free media articles.					
DE250100613	**Distilling Data for Cost-Efficient Recommender Systems**	76,388.50	152,777.00	155,027.00	78,638.50	462,831.00
Yu, Dr Junliang	This project aims to tackle the resource-consuming nature of current recommender systems by innovating data distillation methodologies for these systems. It expects to generate new knowledge in the intersection of data-centric AI and recommender systems. The expected outcomes include a novel data distillation platform that can condense large datasets into compact yet informative data summaries, reducing the resource consumption for dealing with data in recommender systems and embedding cost-efficiency. The benefits of these outcomes will reduce energy use and carbon emission, empower numerous small companies to harness big data intelligence for conducting personalized businesses with low costs, and foster new jobs to in data management.					
	National Interest Test Statement					
	This project targets the pressing issue of high resource consumption in current recommender systems caused by intensive computation on dealing with large datasets. It aims to drastically reduce resource costs in these systems by pioneering novel data distillation techniques which condense large datasets into compact summaries. This research fills a significant gap by underscoring the critical role of data optimization in achieving cost-efficient recommender systems. In terms of national benefits, reducing resource demands aligns with global ecological initiatives and Australia's 2030 emissions reduction target, promising substantial economic savings and carbon emission reduction. The research also democratizes AI tools and empowers small businesses to deploy advanced recommender systems without heavy costs. Moreover, the outcomes of this project can create new jobs in data management and distillation services, catering to businesses needing big data insights but lacking large-scale data processing capabilities. To broaden the impact of this research beyond academia, the findings and developed tools of this project will be integrated into real-world applications through collaboration with industry partners and kept open-sourced. By organizing interactive workshops and training programs, we offer hands-on experiences that showcase the utility of the developed methods across various business scenarios, further bridging the gap between research and practical application.					
DE250100618	**The rules of engagement between transcription factors and cofactors**	81,176.00	161,970.00	158,308.00	77,514.00	478,968.00
Bell, Dr Charles C	Regulation of which genes are switched on and off is of fundamental importance to biology. This process is coordinated by proteins called transcription factors, which directly read the genetic code, and the proteins they recruit called cofactors. This application aims to establish predictive rules of engagement between transcription factors and cofactors, which will address a major gap in our understanding of how the genetic code is interpreted by the cell. Expected outcomes include improved models and tools for predicting and manipulating cell behaviour, which will provide significant benefits for commercial, industrial and biotechnological applications that require control over the behaviour of biological organisms.					
	National Interest Test Statement					
	The regulation of gene activity is of central importance to biology. It underpins the differences between the cells in our bodies and the differences between organisms. Our understanding of this fundamental process has been limited by an inability to establish the rules that determine how each gene is regulated. As a result, it remains difficult to predictably control biological organisms. This project will develop an innovative approach and					

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	methodology to establish the rules that determine how each gene is regulated. Understanding of these rules, will enable prediction and control of which genes are switched on or off in a biological organism of interest, which will dramatically improve the capacity to engineer their behaviour. This will have wide-ranging benefits, particularly for commercial, industrial and/or biotechnological applications, in which control of biological organisms is important part of the production process. Some examples include, bioengineering of plants for drug production, production of new yeast strains for commercial brewing or use of cells for biotechnology. This proposal will also expand our understanding of biological science by providing new insights into a fundamental process that has broad implications for all of biology. Once communicated broadly, this knowledge will hopefully act as a source of inspiration for future scientists.					
DE250100656 Orr, Dr James A	**Manipulating disturbance synchrony to regulate microbial systems** From agricultural soils to the mammalian gut, bacterial communities are often exposed to mixtures of antimicrobials and viruses called bacteriophages. Despite fluctuations in these stressors in natural and managed ecosystems, it remains unclear how the temporal synchrony of phages and antimicrobials mediates microbial community dynamics and the evolution of resistance. By combining emerging ecological theory and high-throughput experiments this project aims to uncover the effect of antibiotic-phage synchrony on microbial ecology and evolution. The knowledge produced by the project is expected to provide significant benefits for the manipulation of microbial systems and for the management of fluctuating stressors in ecosystems.	78,409.50	153,243.00	140,233.50	65,400.00	437,286.00
	National Interest Test Statement Although bacteriophages, viruses that infect bacteria, are thought to be the most abundant biological entities on Earth, surprisingly little is known about their ecological dynamics. For instance, it is unknown how the relationship between a phage and its host bacteria is impacted by co-occurring fluctuations in stressors such as antibiotics. By combining novel tools and perspectives from mathematical ecology and experimental microbiology, this project aims to uncover how the relative timing of antibiotic and phage exposure impacts the ecology and evolution of bacterial communities. Through collaborations with world-leading scientists and a cross-sectional workshop, this fundamental research may ultimately lead to the optimization of antimicrobials and phages in crop production, livestock farming, aquaculture, and human health. A range of high-quality media, including an interactive web application and video animations, will be used to increase public awareness of the importance of antibiotic-phage synchrony, particularly in the context of antimicrobial resistance. Furthermore, the knowledge generated is expected to deepen our understanding of the impacts of fluctuating stressors – such as heat waves, wildfires, and pollution spills – on the microbial communities that are vital for the stability and functioning of Australia's native ecosystems.					
DE250100784 Cole, Dr Emma K	**Gender, Translation, and ancient Greek tragedy** This project aims to identify the causes of gender bias in the staged English-language translations of ancient Greek tragedy, and to redress this problem. Greek tragedy lies at the heart of the Western theatrical repertoire and highlights the experiences of wives, mothers, and daughters, yet audiences usually encounter the plays through male translators. The project's significance lies in ensuring that translations capture the different experiences embedded within ancient drama, to speak to the contemporary moment. Expected outcomes include new translations, scholarly publications, and public performances. Potential benefits include greater diversity within the theatre industry, and increased audience understanding of Greek tragedy.	78,161.50	155,299.00	154,314.00	77,176.50	464,951.00
	National Interest Test Statement Greek tragedy is one of the most commonly performed bodies of work within contemporary Australian theatres. However, there is a huge translator gender imbalance behind the productions, with male writers almost always authoring the staged translations. Audiences might think that they are engaging with the original plays, but they are accessing them through a filter, which research into gender and translation shows often dulls and/or sensationalises the female experience. In the twenty-first century, it is essential that diverse voices capture the different layers of experience embedded within ancient drama, to speak to and reflect modernity. This project aims to fill a research gap surrounding gender and the translation of Greek tragedy. It looks back to identify the causes of the problem, but more importantly looks forward to solutions, creating new, female-authored translations which will increase diversity within the theatre industry and bring cultural benefits to Australia. Collaborations with professional mainstage theatres throughout Australia will ensure that the research develops in dialogue with industry to maximise understanding of the problem. Adopting the proposed solutions and producing the translations would bring economic benefits to individual artists and companies, and has the potential to position Australia as a world leader regarding gender equality in the staging of translated drama.					
DE250100902 Yu, Dr Zhigang	**Bacterial evolution of antimicrobial resistance in urban water systems** Antimicrobial resistance is an international health threat, yet our understanding on whether and how water disinfection could induce this issue in urban water systems is limited. By exploring the impact of water disinfection on the emergence and spread of antimicrobial resistance in water systems, this project expects to reveal the evolutionary trajectories of antimicrobial resistance and control microbial	74,748.50	150,197.00	154,847.00	79,398.50	459,191.00

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	contamination in urban water systems. The outcomes of this project are expected to empower industry partners to combat antimicrobial resistance and secure drinking water quality, thus strengthening Australia's national antimicrobial resistance strategy and positioning Australia in the transition toward more sustainable and healthier life. **National Interest Test Statement** Antimicrobial resistance is recognised as a global threat to human health and economic development. Waterborne pathogens, which can cause severe human infections, have been frequently detected in urban water distribution systems. Although various disinfection processes are widely used to control waterborne pathogens in water supply systems, the emergence and spread of antimicrobial resistance across waterborne pathogens have not been reported yet. By innovatively coupling lab-scale and field scale experiments in real-time, this project aims to fundamentally reveal the evolutionary trajectories of waterborne pathogens and investigate the temporal dynamics of antimicrobial resistance transmission across biofilm pathogens in urban water systems. This project is also practically expected to develop efficient disinfection technologies to achieve simultaneous removal of antimicrobial resistance, waterborne pathogens and biofilms. The discoveries of this project have the potential to propose guidelines and technologies for industry partners to control antimicrobial resistance and secure drinking water quality. The outcomes of this project are expected to provide basic evidence for the development of new drugs with reduced antimicrobial resistance, thus inducing substantial environmental, medical and economic benefits. The project's findings are expected to forge partnerships with industry partners and guide policy development for urban water management.					
DE250100914 Dias, Dr Josephine V	**Large-scale network design for continuous-variable quantum communication** Progress in quantum computing poses a dire threat to cybersecurity and data protection. This has led to worldwide efforts to build a quantum internet - a new type of communications network that can provide an unprecedented level of data security, entirely future-proof against quantum computers. This project aims to design a new quantum internet architecture devised to be significantly more compatible with current telecommunications infrastructure. Expected outcomes of this project include the design of a fundamental building block to construct a cost-effective and materials efficient implementation of the quantum internet. This should provide significant benefits by safeguarding cybersecurity for the future. **National Interest Test Statement** A quantum internet promises a level of cybersecurity unattainable through any known data security methods. It can also improve sensitivity of astronomical measurements and enable quantum computing to be performed over vast distances by sending and receiving quantum information. Building a quantum internet will be vital to ensuring Australia's future cybersecurity and utilising these significant technological advantages. This project aims to design a fundamental building block for the quantum internet. Unlike previous proposals, this project aims to design a new architecture that is compatible with and built from existing telecommunications infrastructure, alleviating the need to rebuild the existing network structure to make it quantum enabled. This project is expected to lead to economic and security benefits for Australia, through the design of a cost-effective quantum internet to ensure future cybersecurity. It will also benefit Australia's projected $6 billion dollar quantum technology industry, by facilitating the connection of multiple quantum computers at different locations using existing telecommunications infrastructure.	62,298.50	124,797.00	124,797.00	62,298.50	374,191.00
DE250100919 Qiu, Dr Ruihong	**Lifelong Paradigms for Versatile, Robust and Agile Recommender Systems** This project aims to revolutionise the traditional static recommendation with novel lifelong paradigms. This project expects to develop the next generation of recommender systems to empower decision making in a fast-changing world. Expected outcomes include a recommendation platform with versatile models to handle heterogeneous data, robust test-time operations to enhance deployment effectiveness, and agile update strategies for efficient model evolution. The success of this project should significantly benefit the society and economy via developing cutting-edge techniques to reduce the energy cost and protect the privacy for Australia's Science and Research Priorities sectors, such as cybersecurity, energy, and environmental change. **National Interest Test Statement** Recommender systems play a pivotal role in today's digital landscape, influencing users' choices and preferences on multiple platforms such as e-commerce websites, content streaming, and other personalised services for future decision making. With the ever-changing preferences of users and the continuous influx of new data, traditional recommender systems face challenges in remaining relevant and secure moving to a more inter-connected future world. To solve these problems, this project aims to transform the traditional static recommendation into a novel dynamic paradigm. This project expects to provide the foundations for the recommendation framework with versatile models for heterogeneous information, robust test-time operations, and agile condensation and model updates. The benefits of this project include not only more powerful recommender systems, but also a more secure defence against newly emerging threats to user data privacy, thereby enhancing e-safety for Australians. This project has the potential to strengthen Australia's competitive position in the global artificial intelligence industry which is forecast to be worth up to $15.7 trillion by 2030. In addition to the direct benefits for the general public and to businesses, this project will also contribute to a more efficient and therefore less	79,316.50	159,576.00	160,662.00	80,402.50	479,957.00

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	energy intensive digital ecosystem, in line with Australia's 'Net Zero by 2050' target.					
DE250101004 Huang, Dr Xia	**Novel cobalt-free cathode materials for next-generation lithium-ion battery** This project aims to pioneer cutting-edge cobalt-free cathode materials for high-energy-density and cost-competitive lithium-ion batteries (LIBs), leveraging transformative oxygen redox to surpass the capacity limits of traditional counterparts. Expected outcomes include new insights into redox chemistry, functional material design, and advanced material processing for low-cost and durable single-crystalline cathodes. This will enable commercially viable LIB technology for enhancing the affordability of long-range electric vehicles. Thus, the project's success will position Australia at the forefront of energy storage technologies, aligning with the National Electric Vehicle Strategy and contributing to Australia's Net Zero 2050 Commitment.	67,714.00	140,205.50	145,995.50	73,504.00	427,419.00
	National Interest Test Statement Australia's Critical Minerals Strategy 2023-2030 prioritises expanding the nation's influence in downstream processing and fostering high-value projects to establish novel industries, notably in the realm of clean energy technologies. Leveraging its abundant natural resources and advanced mining industry, Australia stands at a strategic vantage point in the lithium-ion battery (LIB) supply chain. Despite this, there lacks value-added battery-grade material producers in the country. This project seeks to bridge this gap by developing innovative and robust cathode materials for next-generation LIBs with high energy density and cost-effectiveness. This initiative will equip domestic manufacturers, including long-standing industry partner Lithium Australia, with a cutting-edge, cost-competitive material process technology. The goal is to facilitate the mass production of top-tier cathode materials using Australian minerals, propelling the nation from being the world's largest low-value lithium mineral exporter to a global leader in manufacturing high value-added battery materials. Beyond economic advantages, the resulting high-performance LIBs hold the potential to enhance the affordability of long-range electric vehicles, contributing to a carbon-neutral future. The success of this project will position Australia prominently in clean energy technologies, aligning with the National Electric Vehicle Strategy and reinforcing the country's commitment to achieving Net Zero by 2050.					
DE250101051 Zhang, Dr Xueqin	**Reversible methane metabolism in methanogenic and methanotrophic archaea** Methane is a potent greenhouse gas with a global warming potential 28 times that of carbon dioxide. Microbial methane metabolism – mediated by methanogenic and methanotrophic archaea - is responsible for controlling methane emissions, as such playing a crucial role in balancing the global methane cycle. However, our current understanding of this process is still poor. This interdisciplinary project aims to enhance our knowledge of reversible methane metabolism in these archaea and will lead to improved techniques for characterizing their physiology. Ultimately, this research will reveal previously unknown metabolic capabilities and pathways, enabling us to make more accurate predictions of global methane emissions in a changing climate.	75,979.50	146,898.00	147,960.00	77,041.50	447,879.00
	National Interest Test Statement The global methane budget is regulated by microbial methane metabolism. Methanogenic and methanotrophic archaea mediate methane production and oxidation, respectively. This project aims to identify metabolic versatilities and novel pathways of these archaea and understand how these pathways are linked to cryptic parts of the carbon cycle. The study will employ a combination of traditional cultivation techniques and cutting-edge microscopic, spectroscopic, and molecular microbiological methodologies to investigate the reversible metabolic capability and pathways of these novel archaea. By gaining insights into the metabolism of these archaea, we can assess their contribution and impact on global methane cycling and climate change. The outcomes of this project will have significant environmental and social benefits, aligning with Australia's 2050 net-zero emission goal. Additionally, the research outcomes will aid in predicting the methane budget in geographically distributed subsurface environments, helping to identify methane-emitting hotspots. This will support policymakers in achieving environmentally sustainable management or mitigation of methane emissions, as well as in adapting to the impacts of environmental change on biological systems, urban and rural communities, and industry.					
DE250101070 Pattinson, Dr Cassandra L	**Understanding Light, Technology, and Environments of Children** Light (both natural and artificial) is vital. The timing, colour (spectra), and intensity of light exposure has a profound impact on our sleep and wake cycles, alertness, and mood. However, our light environments have changed rapidly with advances in technology and urbanisation. The effect of these changes on children's sleep, cognitive function, and wellbeing is unclear. This study aims to objectively map the artificial and environmental light experienced by children, 5 - 8 years, against their sleep, cognitive function, and wellbeing. This innovative quantification, via novel wearable technology, will advance knowledge to support optimal child development and guide practice and policy around children's light exposure and environments.	80,272.50	160,827.50	161,966.00	81,411.00	484,477.00

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	National Interest Test Statement Light allows us to see and function in the world. However, unprecedented advancements in our built and digital environments mean that children are growing up in contexts detached from the natural rhythm of light. Light is critical for the alignment of our internal body clock, which affects sleep, mood, alertness, cognition, and social function. In an international first, this project explores the natural, artificial, and digital lighting environments of early primary school aged children. This project will utilise novel wearable monitoring devices to objectively measure children's light, their environments, and their sleep and activity as they go about their everyday lives. Optimising the resilience, development, and wellbeing of children is critical for a productive and inclusive future for all Australians. This fellowship sits at the forefront of current research, answering national and international calls for in-situ observation of light and its effects on developmental outcomes. The advance in knowledge generated from this study will inform the rethinking of policy and practice in how lighting is incorporated in children's built environments, their social lives, and their 'digital childhoods'. Optimised light exposure in the home and at school can help set positive foundations early in life. The goal of this project is to optimise light exposure and built environments to support strong, positive trajectories in education and social participation for Australian children.					
DE250101083 Khatri, Dr Bhavesh	**Harnessing the potential of natural peptides through chemical design** This project aims to re-engineer bioactive disulfide-rich peptides, such as those found in the venom of cone snails, to improve their therapeutic potential. These peptides are highly selective and potent towards a range of ion channels and receptors, but they suffer from rapid proteolytic degradation and poor permeability to cell membranes. This project focuses on developing strategies to improve their pharmaceutical properties to overcome obstacles in achieving oral bioavailability. Expected outcomes include new knowledge about structure-activity relationships, leading to a solid platform for the future development of peptide-based therapeutics, thereby resulting in considerable economic benefits.	77,452.00	148,170.50	145,862.00	75,143.50	446,628.00
	National Interest Test Statement Australian flora and fauna offer a wide range of bioactive peptides with potential applications in agriculture, biotechnology, and medicine. Nonetheless, these peptides are often unsuitable for direct use in their native forms due to their unfavourable pharmacokinetics. Thus, their intrinsic challenges must be solved to expand the utility of these natural peptides. This project will generate new knowledge and strategies to address the inherent drawbacks that will provide instrumental information for developing the next generation of peptide-based therapeutics. With approximately $70 billion global peptide therapeutics market, the project's new IP will create significant commercial and economic benefits. The underpinning new and innovative approaches would have excellent prospects for industry investment, strengthening Australia's global position as a leader in peptide therapeutics.					
DE250101093 Selvanathan, Dr Hema Preya	**The psychology of everyday resistance** Public protests and social movements garner attention, but they represent only one form of dissent. This project aims to investigate the crucial yet overlooked phenomenon of everyday resistance: individuals routinely and quietly opposing injustice in daily life. Using innovative mixed methods, comprising qualitative, experimental, longitudinal, and cross-national surveys, it will examine resistance across diverse contexts and populations. This project expects to generate new knowledge on why people resort to everyday resistance, its impact on wellbeing, and its link to overt protests. This should benefit society by informing pathways to social change and guiding effective responses to community needs, fostering more equitable societies.	78,183.50	156,757.50	158,386.50	79,812.50	473,140.00
	National Interest Test Statement When social movements and public protests erupt, they sometimes seem to emerge suddenly, seemingly out of nowhere. However, these actions may have roots beneath the surface and are likely to manifest following periods of more hidden and routine forms of protests in response to unfair treatment, known as everyday resistance. Examining the psychology of everyday resistance contributes to a more comprehensive understanding of protests, a core feature of democracy with implications for political stability and social cohesion in Australia and beyond. This project will create a paradigm shift by moving beyond relying solely on visible protests as the indicator of societal discontent and dissent. This can have downstream benefits to practitioners and community leaders by informing effective responses to the needs of diverse groups. Recognising subtle forms of dissent can help policymakers create initiatives that are more attuned to concerns of communities, ultimately fostering more inclusive and responsive governance structures. Moreover, insights on the psychological consequences of engaging in daily acts of resistance can contribute to the development of support systems and interventions that promote individual wellbeing. To support pathways to broad societal applications of this knowledge, the project involves plans to disseminate findings to public audiences and leverage outreach opportunities with key stakeholders interested in social equality, democracy, and social change.					
DE250101177 Gao, Dr Mile	**Charge carrier behaviour in organic semiconductor optoelectronic devices** The project aims to develop universally applicable techniques for studying charge carrier behaviour in organic semiconductor devices. The project also aims to apply these techniques to provide key insights into charge generation, transport, and recombination processes, which determine organic	77,783.50	157,847.00	160,327.00	80,263.50	476,221.00

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	semiconductor device performance. Expected project outcomes include the development of cutting-edge measurement techniques, and identification of and methods to advance the performance of state-of-the-art organic semiconductor devices. The benefits of this project are expected to include high-performance organic semiconductor devices and techniques that can underpin basic research as well as translation of technologies to market. **National Interest Test Statement** The generation of affordable as well as efficient use of energy is critical to all sections of society, from industry to domestic use. Technologies that can generate, use energy efficiently, and/or have low embedded manufacturing energy costs are therefore critical. Organic semiconductor technologies have the capability of contributing to improving energy efficiency. For example, organic photovoltaic solar cells are expected to play a role in future power generation and organic light-emitting diode-based lighting has the potential to have double the efficiency of fluorescent lighting. However, to enable such devices to contribute to energy efficiency requires that all facets of their device properties are understood. This project aims to provide techniques that will give information on the fundamental characteristics of the charges that are used in organic solar cells and light-emitting devices, which is an area that is often overlooked. It is expected that the methods developed and understanding gained will be broadly applicable across next generation thin film solar cell technologies such as perovskites and kesterite devices, and photodiodes that can be used in imaging and autonomous systems. The former technologies have the potential to help Australia meet its carbon neutrality target through translation to industry before 2050, while the latter can provide pathways to improving our defence and security personnel and provide a safer society.					
DE250101272 Liu, Dr Min	**Engineering Nanomembranes for Direct Air Capture of Carbon Dioxide** It has become evident that maintain global warming at 1.5 °C cannot be achieved simply by reducing carbon dioxide emissions through traditional precombustion and postcombustion carbon dioxide capture. A more progressive approach, known as direct air capture of carbon dioxide, is necessary to directly reduce the atmospheric concentration of carbon dioxide. This project aims to advance the understanding of membrane technologies for direct air capture of carbon dioxide, establish the groundwork for fabricating efficient and scalable nanomembranes for this critical application. **National Interest Test Statement** As an important party to the Paris Agreement, the Australian Government's aims to reach a 43% emission reduction below 2005 levels by 2030 and achieve net zero emissions by 2050. Therefore, an urgent need exists to develop technologies for capture carbon dioxide from the air via more efficient, environmentally friendly, and cost-effective routes. This project focuses on establishing a nanomembrane technology platform that enables the manufacturing of high-performance membranes for direct air capture of carbon dioxide. The successful implementation of this project will advance the Australian Government's Strategic Research Priorities in 'Advanced Manufacturing', strength Australia's existing research leadership in 'Advanced Materials', complement the Australian Government's Strategic Research Priorities in 'Energy' and 'Resources'. It also aligns directly with the 'Australian Government's National Innovation and Science Agenda by training Australia's next generation of scientists in a high-quality research environment'. Additionally, the high interdisciplinarity of this project will provide opportunities to build strong collaborations across academia and industry, enhancing knowledge and technology transfer from international partners to Australia.	67,248.50	134,197.00	133,897.00	66,948.50	402,291.00
DE250101412 Zheng, Dr Qiuda	**Understanding the vaping epidemic through novel integrative monitoring tool** This project aims to pioneer an innovative strategy for timely insights into vaping epidemic, intergrating wastewater analysis and human biomonitoring. The project expects to generate systematic evaluation of vaping biomarkers, a retrospective analysis of vaping patterns within communities, at daily resolution and across distinct age groups, and integrate vaping data with diverse regulatory frameworks. The expected outcome is a robust evaluation of existing vaping control measures, furnishing policymakers with evidence-based insights to shape future vaping policies. This provides significant economic and social benefits by helping authorities navigate the dynamic landscape of vaping including its swift market shifts and legal intricacies. **National Interest Test Statement** This proposed DECRA project aims to develop a novel integrative monitoring tool that combine wastewater analysis and human biomonitoring to investigate vaping prevalence across diverse populations and assess the effectiveness of vaping regulations on specific age groups. Vaping has emerged as a significant concern in Australia, yet our understanding of its prevalence is limited, hindering effective control measures, particularly among the youth. The research carries dual benefits for Australia, contributing significantly to both economic and social benefits. By supporting public health measures against vaping, this DECRA hold the potential to enhance community well-being nationwide. Moreover, the research directly supports the Australian Government effort in addressing illicit vaping, offering valuable insights in border control that can revolutionize law enforcement. The evidence generated across various regions of Australia can transform strategies for combating the illicit vaping market by enabling more strategic resource allocation and targeted activities, thereby advancing the effectiveness of regulatory measures. The research will be promoted to key government stakeholders via our existing relationships with the ATO, ABF. This will include technical reports, meetings and workshops to ensure the data produced it delivered to maximise understanding and adoption in government policies and practices.	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00

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	The University of Queensland	1,208,723.00	2,416,760.50	2,414,337.50	1,206,300.00	7,246,121.00
University of Southern Queensland						
DE250100012	**Development of a surface reconstruction model for re-entry objects**	77,058.50	158,432.00	161,807.00	80,433.50	477,731.00
Birch, Dr Byrenn	More than 300 tonnes of spacecraft re-enter Earth's atmosphere each year, with about 30% of this surviving re-entry; posing risk to people, property and transport. Currently, the ground risk for an object is estimated prior to launch, however the numerical tools used for this analysis require the estimation of what altitude objects are released, and what these objects are. This project will develop a surface reconstruction model that uses the light emitted from the surface of the re-entering objects to: spatially resolve their surface temperature; and can identify objects during a re-entry break-up event, both of which are required to provide much-needed validation data for the numerical tools used to assess the ground risk of re-entry.					
	National Interest Test Statement Hundreds of tonnes of human-made space objects re-enter the Earth's atmosphere annually. 30% of this mass is predicted to strike the Earth’s surface. A significant fraction of this mass re-enters without any de-orbit control. As the commercialisation of the space industry increases, space debris re-entering Earth’s atmosphere will also increase. Nearly all objects over 500kg which have re-entered uncontrolled orbited over Australian land, and therefore posed risk to Australian people and property. To mitigate this risk, numerical models are used to estimate the ground risk prior to launch. These tools lack validation from real re-entries as there are no methods to identify spacecraft components in the dispersion process. This project will develop the first methods to identify these components from imaging spectroscopy measurements. By enhancing these simulation tools, the risks to life and property posed by Australian and other space assets can be evaluated with greater precision, minimising the potential disruption to private, industrial, commercial and national activities on Earth. The methods developed in this project will be essential for the validation of return capsules in the future space manufacturing industry, and industry where Australia holds significant geographic advantages.					
DE250100773	**Revealing invisible stellar interiors using starquakes in star clusters**	75,448.50	153,147.00	155,397.00	77,698.50	461,691.00
Li, Dr Gang	The project aims to study stellar and cluster evolution synergistically, using stellar oscillations as a key tool. This project expects to understand the fundamental physics of stars, specifically focusing on accurately describing angular momentum transport and inside element mixing. Expected outcomes include an enhanced stellar evolution model with well-calibrated rotation and mixing processes, which will advance a broad range of astrophysical research, from exoplanets to clusters and galactic archaeology. The benefits of this project include enhancing the global reputation of Australian observatories and strengthening Australia's leadership in ongoing space-based missions, in line with the burgeoning space-based era of stellar physics.					
	National Interest Test Statement By studying starquakes (similar to earthquakes) in a group of stars born at the same time, this project will greatly advance our understanding of stellar interiors, especially internal rotation, element composition, and magnetic fields, which are currently largely unexplored but crucial for various astrophysical research areas. By using space-based and Australian telescopes, this project will provide unprecedented insights into the birth, evolution, and activity of stars. The results can be applied to our Sun to mitigate disruptions to satellite communication and power outages caused by solar eruptions, such as the geomagnetic storm that occurred in March 1989 and subsequent events in 2000 and 2003. The unique role of Australian telescopes in this project will boost the influence of Australian observatories. The project will also analyse data observed by international space-based telescopes, enhancing Australia’s global cooperation and leadership in this area of astrophysics. As part of the Decadal Plan for Australian Astronomy 2016–2025, this project positions Australia at the forefront of global astronomical research. It will inspire the next generation of Australian astronomers and reinforce the nation's capabilities in science, technology, engineering, and maths. Astronomy naturally captivates the general public, and the research outcomes of this project will be disseminated to the public through general science lectures, media interviews, and social media.					
	University of Southern Queensland	152,507.00	311,579.00	317,204.00	158,132.00	939,422.00
University of the Sunshine Coast						
DE250100153	**Optimising camera and on-road police enforcement to prevent speeding**	65,092.50	137,209.00	145,189.00	73,072.50	420,563.00
Truelove, Dr Verity E	Speeding is the largest contributor to crash related road deaths and injuries. This project aims to create a framework for optimising on-road police and camera speed enforcement across rural,					

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	remote and metropolitan areas. The project will use innovative approaches to identify how to address cognitive biases associated with perceptions of deterrence and enhance existing enforcement resources. This framework will inform the best mix of different types of camera and police enforcement for speeding across the road network. This will provide significant benefits in preventing speeding and reducing the high road trauma rates on Australian roads. **National Interest Test Statement** Road trauma in Australia is a significant social, economic and health issue costing $2.9 million per fatality and $241,000 per hospitalised injury. Speeding is the largest contributor to road crashes and speeding related trauma rates have not decreased in the last decade. The different types of speed cameras and on-road police enforcement vary in their effectiveness in reducing crashes depending on the way they are employed. As such, there is a need to optimise the mix of approaches used. This project will address an important research and policy gap by providing evidence to inform how to enhance existing enforcement resources to best prevent speeding across rural, remote and metropolitan environments. This includes the selection of the best enforcement approach to match the characteristics of the road and nature of the crash problem. Cognitive biases (i.e., mental shortcuts) will also be investigated to identify how drivers' information processing can be used to influence perceptions of speed enforcement. The findings will be provided to road safety jurisdictions to help guide planning of speed enforcement activities, providing a low-cost solution for reducing speed related road trauma. The study design incorporates the views of key stakeholders and community members and also makes use of an expert policy-focused reference group, maximising the opportunity for, and feasibility of uptake of the research findings.					
	University of the Sunshine Coast	65,092.50	137,209.00	145,189.00	73,072.50	420,563.00
	Queensland	2,950,946.50	5,915,461.50	5,936,616.00	2,972,101.00	17,775,125.00

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South Australia						
Flinders University						
DE250100116	**Contesting Conquests: Pre-Modern Attempts to Come to Terms with the Past**	78,698.50	156,752.00	159,442.00	81,388.50	476,281.00
Firth, Dr Matthew	This project aims to provide extensive new knowledge about how societies experience and remember the trauma of conquest and colonisation. The project expects to make an innovative contribution to our understanding of histories of conquest, with a research focus on medieval and early modern English history writing. Anticipated outcomes include an unprecedented comprehensive study of the reception and transmission of England's medieval conquests that will offer new insights into the intergenerational impact of conquest. This should provide significant benefits both inside and outside the academy through a wealth of novel evidence in support of ongoing debates around the legacies of conquest and colonisation in England, Australia and beyond.					
	National Interest Test Statement					
	Experiences of conquest and invasion are instrumental in shaping cultural identity and national mythologies, even hundreds of years after they have taken place. The conflicting accounts of conqueror and conquered are long lived in cultural memory and draw public attention; however, knowledge of how perceptions of these events change over time is greatly unknown. This research represents the first major study of cultural attitudes towards conquest and colonialism in English history writing over the length of the Middle Ages. It examines the transmission and adaptation of England's early medieval history during its 900-year transition from a conquered society to one that engaged in its own program of colonial expansion. This will transform our understanding of how societies construct histories of conquest. The project will develop new methodologies for understanding the past that will constitute an important addition to wider debates within world literature, history, and post-colonial comparative studies by offering a more inclusive and representative vision of history writing. This will benefit Australians by providing new knowledge that can act as a template for the renewal of the important, contested and controversial ways that Australia thinks of its own histories of invasion, colonisation and societal trauma. Project outcomes will be communicated nationally and internationally online and through publications and broad media platforms such as via the ABC.					
DE250100256	**Defining the evolution of apex arthropod predators**	81,395.00	160,907.00	151,038.00	71,526.00	464,866.00
Bicknell, Dr Russell D	Predation has been a central driver of evolution for more than 500 million years. Predatory arthropods, like crabs and scorpions, induce changes in their prey, such as increased speed, camouflage, and reinforced body parts. Concurrently, predators enhance their own ability to locate, pursue, and subdue prey. The aim of this project is to test whether the predatory arthropods converge upon functionally comparable adaptations, across lineages and over deep time, and the ecological ramifications of these structures. Expected outcomes and benefits include an innovative foundation for reconstructing ecologies of living and extinct Australian arthropods and answering long-standing questions regarding predator/prey co-evolution.					
	National Interest Test Statement					
	Predators are a core evolutionary driver within ecosystems and influence biological changes within prey, but how predators themselves change over time in response to prey remains mostly unknown. Using archived specimens from Australian and international museums, this project will implement advanced biomechanical modelling to create and analyse 3D structural models of over 300 living and extinct arthropods (e.g. crabs, scorpions, and spiders). This will create new knowledge in predator functionality, and will define how predatory arthropods evolve and refine structures, like pincers, in response to past and ongoing ecological changes. The resultant digitisation of specimens will also preserve these natural treasures from possible degradation in the future. The digital replicas and scan data produced in this project will be made freely available online and through outreach with museums across Australia, providing significant social and environmental benefits for Australians by providing information relevant to species conservation efforts and increasing accessibility and longevity of Australian museum collections.					
DE250100525	**New catalysts to harness electricity and light for chemical synthesis**	81,286.00	162,734.50	162,897.00	81,448.50	488,366.00
Nicholls, Dr Thomas P	New catalysts capable of harnessing electricity and visible light will be synthesised, extensively characterised, and used to develop new chemical reactions. The result will be catalysts that are more efficient and robust, enabling access to valuable molecules. The production of these catalysts will enable a better understanding of the intrinsic electrochemical and photophysical processes involved in electrophotocatalysis. The development of new synthetic methodology using these catalysts will enable a sustainable method to streamline access to large libraries of chemical compounds that are					

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	valuable especially to the pharmaceutical, agrochemical, textile industries and more. **National Interest Test Statement** Artificially produced chemicals are a crucial component in many industrial processes, such as pharmaceuticals, agriculture, textiles, and the food industry to name a few, contributing significantly to the Australian economy. However, the synthesis of such chemicals is one of the largest industrial energy consumers and producers of CO2 emissions. This project will investigate novel ways of producing chemicals using renewable energy sources such as electricity and light in the manufacturing process. Currently, there are very few chemical manufacturing processes capable of using electricity and light, and those that do exist, have very low efficiencies. Australians will benefit from environmental improvements that will follow from the outcomes of this project through reduced energy consumption and CO2 production, and from the positive economic impact of the discovery of new, industry relevant artificial chemicals, for example, in the form of new medicines, fertilisers, and textiles. To ensure that the significant potential commercial impact is realised, the outcomes of the research will be shared with relevant industry professional bodies and directly with selected industry partners who are in a position to commercialise the discoveries. Outcomes will be shared publicly through media engagement and outreach programs such as The Conversation.					
DE250101060 Reynolds, A/Prof Amy C	**At the intersection: Sleep disorders, shift work and young driver safety** Young workers are highly vulnerable to road safety accidents and fatalities. Two key factors that likely contribute to accidents are high prevalence in young drivers of shift work (>25%) and sleep disorders (>20%). This combined burden is rarely considered and represents a blind spot in understanding of young driver safety risks. This project will investigate the interplay between transition to shift work, sleep disorders and road safety for young drivers. Through this, I will provide a clearer understanding of decisions to drive drowsy, relationships with road safety incidents and protective factors to target. I will design interventions to help reduce the $147M of social costs attributable to drowsy driving fatalities in young drivers **National Interest Test Statement** Young drivers have the highest rate of road safety events in our community, with young Australian drivers accounting for 19% of fatalities in 2022. Despite investment in road safety initiatives, little progress has been made in the last decade towards reducing these numbers in this vulnerable road user group, signifying the urgent need for intervention to improve road safety. Drowsy driving is reported by >80% of young drivers, but causes are poorly understood in this age group. This project will focus on understanding young driver behaviour and decisions to drive drowsy to identify innovative intervention strategies focussed specifically for young shift workers at high risk for sleep disorders. This will be the first time a targeted inquiry and intervention approach is taken for this problem. With an estimated $147M incurred in social costs related to road fatalities involving drowsy driving in young adults, solutions informed by this project will provide significant social and economic benefits to the Australian community. This project will address two National Science and Research Priorities; supporting health and thriving communities, and enabling a productive and innovative economy. Project outcomes and interventions will be designed in direct collaboration with key stakeholders (Sleep Health Foundation, Australian government road safety authorities), ensuring effective research translation and adoption.	81,444.50	162,875.00	162,596.00	81,165.50	488,081.00
DE250101193 Henry, Dr Claire L	**Tackling the consumption of sexual violence on screen** The explosion of image-based sexual abuse (IBSA) and child sexual exploitation material (CSEM) online is causing significant harm and presenting regulatory quandaries. Australia would be better prepared to tackle this escalating issue equipped with deep understanding of how the intersection of sexual violence and screen media has been conceptualised and regulated in other media (film, television and video games) and translated to online content. This research will advance our ability to prevent IBSA and CSEM consumption by investigating institutional discourses across media regulators (in Australia and overseas) and enhancing the cross-national and cross-sectoral dialogue on how to best address the consumption of sexual violence on screen. **National Interest Test Statement** Australian society and regulatory agencies are faced with the rapidly evolving and expanding issue of image-based sexual abuse and child sexual exploitation material. The online circulation of images produced by these forms of technology-facilitated sexual violence are causing significant harms to individuals (including emotional distress, trauma, stigmatisation, and impacts on relationships and employment) and to society (reinforcing gender inequality, sexualisation of children, and erosion of online safety and trust in digital platforms). This research seeks to build innovative and effective approaches to mitigating the harms posed by widespread consumption of sexually violent screen content. Tackling sexual violence is an Australian government priority and this research aligns with the National Plan to End Violence against Women and Children 2022–2032 in its call to embed prevention in media and the arts and with the National Strategy to Prevent and Respond to Child Sexual Abuse 2021–2030 in its attention to online abuse. The rigorous assessment of content regulation approaches undertaken in this project will underpin more effective approaches to policy and prevention to benefit Australians through a reduction in sexual violence and media harms. The communication and translation of research outcomes will be maximised through an international summit and policy report, a multi-stakeholder forum, and community outreach including a national roadshow and a podcast series.	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00

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	Flinders University	404,272.50	806,165.50	798,870.00	396,977.00	2,406,285.00
The University of Adelaide						
DE250100435	**Emergent phenomena in chaotic active matter**	76,263.50	153,802.00	156,402.00	78,863.50	465,331.00
Valani, Dr Rahil N	Active matter is a nascent area concerned with collective motion of many interacting active entities such as human crowds, bird flocks and robotic swarms. Many active entities show signatures of chaos that cannot be captured by traditional active matter models. By undertaking a novel interdisciplinary approach connecting active-matter physics with the mathematics of chaos, this project aims to investigate the effects of encoding chaos in individual active entities on emergent collective behaviours and their subsequent control. It expects to generate foundational knowledge in active matter with potential applications in controlling collective motion of engineered systems (e.g. robotic swarms for search missions and environmental monitoring).					
	National Interest Test Statement					
	Swarming robots, human crowds and fish schools are all examples of ‘active matter’, an emerging research area that focuses on how large groups of active and interacting entities behave together. In traditional active-matter models, the complex irregular movement of a single entity is usually described by stochastic (random) motion. However, many active-matter systems show characteristics of low-dimensional chaos, which cannot be captured by stochastic models. Chaos is irregular but can be controlled by varying parameters of the underlying system. By undertaking a unique interdisciplinary approach, bringing together the physics of active matter with the mathematics of chaos, this project will investigate in-depth the collective behaviours observed in active matter as driven by chaotic systems rather than randomness. It will open up new possibility for predicting and controlling collective behaviours. This project will not only advance Australia’s leadership in the fundamental science of active matter, but also present wider industry or public-service applications and other commercialisation opportunities. For example, swarms of chaos-driven autonomous mobile robots or drones, may be used for search-and-rescue missions or disaster recovery. Outcomes will be shared broadly with scientific community and the public via conferences, research articles, open repository platforms, and STEM outreach initiatives like workshops for local school students.					
DE250100603	**High-energy cathode materials for next-generation lithium-ion batteries**	69,948.50	142,897.00	145,647.00	72,698.50	431,191.00
Liang, Dr Gemeng	Lithium-ion batteries (LIBs) are failing to meet the needs of developing technologies due to their limited energy densities, stemming primarily from cathode materials in use. This project aims to develop high-energy and low-cost Li-rich manganese-based oxide cathodes for next-generation LIBs, and pursues an integrated strategy from material synthesis to full battery performance optimisation to promote their practical application. This project will innovate in modification strategies and structure designs to tackle their existing issues. Project success will position Australia as a leader in the development of high-performance battery technologies, particularly for electric vehicles, contributing to both economic and environmental benefits.					
	National Interest Test Statement					
	Vehicle electrification has gained worldwide popularity as a response to global climate change, yet it encounters power supply challenges due to the limited energy densities of lithium-ion batteries. Currently, cathode materials control both the performance and cost of lithium-ion batteries. This project aims to address battery performance limitations by developing novel, high-performance, and cost-effective cathode materials. This project will establish a full integrated strategy from material synthesis to performance optimisation in practical batteries to accelerate the process of commercialisation. In addition, this project will create new frontier knowledge and intellectual property in materials engineering, electrochemistry, and energy storage for Australia. Project breakthroughs will lead to Australian or United States patents, creating new business opportunities for battery industries. The success of this project will position Australia as a leader in implementing next-generation, high-performance lithium-ion batteries in electric vehicles, and will reduce Australia’s reliance on non-renewable fossil fuels thus contributing to net-zero targets. Project outcomes will be promoted through academic seminars and industry expos, public talks and social media, and included in the high school STEM curriculum.					
DE250100722	**Shark-inspired remote sensors**	81,448.50	157,772.00	146,897.00	70,573.50	456,691.00
Law, Dr Cheryl Suwen	The project aims to develop new-generation sensors, inspired by specialised receptors in shark skin, that will remotely detect objects based on their unique electrical, optical, and thermal fingerprints, by integrating advanced materials into smart architectures. This is expected to generate new knowledge in bioinspired engineering, using a multidisciplinary approach to develop materials with precisely tailored nanoscale properties for unprecedented remote sensing. The outcomes are likely to lead to advanced remote sensors that overcome the limitations of current systems, with significant benefits					

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	for addressing global challenges such as space exploration, personalised healthcare, climate change monitoring, and national security. **National Interest Test Statement** Shark skin has been precisely engineered by nature over millions of years to remotely sense tiny variations in electric and magnetic fields, pressure, temperature, and salinity. Synthetic sensors that can mimic this extraordinary biological capability will enable transformative technology for the detection of objects, and enhanced decision-making, and situational awareness. This project will develop integrated bioinspired nanosensor structures, gels, and multi-dimensional functional systems aimed at ultrafast responses and prediction that exceed the natural structures in shark skin. This shark-inspired remote sensing approach will address the constraints of current synthetic sensing technologies in functions, adaptability, and detection range that arise from their energy-intensive and inefficient information transduction mechanisms and rigid structure. The research is expected to provide Australian scientists and industries with cutting-edge tools that benefit multiple emerging technologies (e.g., human–machine interfaces, wearable sensors, artificial skin, and autonomous navigation) devised to solve national challenges such as climate change monitoring, medical and health diagnosis, and national security and defence. The research outcomes will be disseminated via publications, conferences, public talks, and social medias. Technological translation and commercialisation will be accelerated by close collaboration with industries in the advanced manufacturing sector.					
DE250100753 Zhang, Dr Jinqiang	**Photothermal Catalytic Methane Dry Reforming for Scalable Syngas Production** This project aims to develop novel non-noble metal/metal oxide materials with multiscale metal-support interfaces for unravelling photothermal catalytic mechanism, efficiently harnessing full-spectrum sunlight, and robustly converting carbon dioxide and natural gas into high value-added fuels. Innovations are expected in the rational design and tailoring of materials, fundamental knowledge in photo-driven catalysis and breakthroughs in solar energy utilisation for carbon dioxide and methane conversions. Expected outcomes will present a series of structure-tailored, activity-enhanced and selectivity-oriented photothermal catalysts for scaling production of solar fuels, tackling the challenges of energy crisis and climate change in Australia. **National Interest Test Statement** Climate change and energy crisis are devastating issues facing Australia and the World. Production of clean fuels emerges as a multifaceted solution with the potential to positively impact environmental sustainability, public health, economic development, and energy security. However, they are not currently viable due to the high production costs and unsatisfactory yields. This research project aims to overcome these economic and technical barriers by strategically leveraging the functionalisation of photothermal catalysts and designing and engineering advanced reaction devices to harness full-spectrum sunlight for converting carbon dioxide and methane into clean syngas fuels. Successful implementation of this project will promote Australia's leading role in developing strategies for cost-effective utilisations of natural gas resources and solar energy, both for clean fuels generation and beyond it, with potential implications in environmental sustainability. The results will also have great significance for innovating conventional chemical industry to a low-carbon and sustainable manner, thereby delivering significant benefits to Australian industries and the living environment. Beyond disseminating research outcomes in prestigious journals, wider community engagement will be conducted through workshop with potential end users, enabling the transformative impacts to clean energy sector.	72,948.50	143,397.00	145,397.00	74,948.50	436,691.00
DE250100791 Watson, Dr Emma E	**Nucleic Acid-Based Molecular Circuitry to Control Biological Processes** Via cutting-edge organic chemical synthesis, this DECRA project aims to develop new molecular circuitries for use in biosensing and control. These will be based on the programmable recognition of synthetic nucleic acids and new applications of established chemical reactions that allow for the release of functional molecules only when desired. Two new circuitry modules will be developed and tested - the first a cleavable nucleic acid scaffold for precise light-dependent uncaging, and the second a novel proximity-mediated release system for tissues inaccessible to light. Benefits for Australia span applications in biotech (real-time molecular sensing), fundamental biology and drug development (targeted drug delivery). **National Interest Test Statement** Cells are molecular machines with thousands of sensors and switches made from biomolecules; these allow cells to control every portion of their function with extreme precision. While large and complex, these systems are based on three core components 1) a sensor to detect a signal, 2) circuitry to translate the signal and 3) an output to cause a detectable change. Using biological building blocks, this DECRA project will employ cutting-edge chemical synthesis to make designer molecular circuits able to sense and control a range of important biological processes. DECRA breakthroughs will fill a current gap in available technologies for precise control of biologically active molecules for use in fundamental biology, biotechnology and drug delivery. Expected benefits include the detection of viral contamination in bio-manufacture facilities such as those used in vaccine production (which is associated with $ billions in lost productivity) and the ability to understand biological processes at the molecular level. This project will train a new generation of interdisciplinary scientists to build critical Australian capacity, while improving productivity and efficiency through smart chemical systems for control and monitoring within biotechnology (AUD $8 billion p.a.) and other sectors. In addition to publications in high impact journals following IP protection, project results will be promoted to a broad audience through public talks, news articles and social media engagement.	81,448.50	160,397.00	160,347.00	81,398.50	483,591.00

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
DE250100998	**Energy saving through flow pulsation in pipelines**	80,948.50	148,097.00	134,047.00	66,898.50	429,991.00
Freidoonimehr, Dr Navid	This project aims to reduce the costs and environmental impacts associated with transporting fluids such as drinking or wastewater by enhancing our understanding of how turbulence within pipelines drives fluid loss and increases the energy required to maintain flow. Through extensive experiments, this project aims to advance our knowledge regarding the turbulence characteristics of the pulsatile flow and offer crucial insights into how pulsatile profiles can be used to develop turbulence suppression methods. Such progress will contribute to the establishment of methods that could significantly mitigate the environmental impact of pipeline transportation, thus fostering a more sustainable future in Australia.					
	National Interest Test Statement					
	Pipelines are widely used domestically and industrially in transporting liquids and gases. About 10% of global electricity is consumed to overcome inefficient pipe flow due to viscous losses caused by turbulent flow. Flow pulsation enables an innovative approach to improve pipeline flow efficiency. Imagine the way a heart beats; nature has already shown us how pulsation can be effective. This project capitalises on limited proof-of-concept work and uses extensive experiments to understand pulsating turbulent pipe flows better. This project will develop an innovative method of flow pulsation, which could potentially reduce viscous losses and, as a result, decrease the power needed for pumping by 5-15%. This research holds considerable practical potential for commercial-scale pipe networks, particularly for transporting drinking water, natural gas, and wastewater. Reducing the energy consumed in pipeline transportation can provide significant economic and environmental benefits to Australia. By implementing technology that overcomes viscous losses caused by turbulent flows in pipes, we not only reduce energy costs but also contribute to a more sustainable future by reducing energy and greenhouse gas footprints. Research outcomes will be promoted through open-access platforms, journals, conferences, and social media outlets. To ensure effective translation of the research findings, collaborative efforts will be fostered with technology developers and the pipeline industry.					
DE250101071	**Ab initio design of high-entropy alloy catalysts for metal-CO2 batteries**	73,888.50	150,527.00	151,277.00	74,638.50	450,331.00
Yuwono, Dr Jodie A	This project aims to rationally design efficient high entropy alloy (HEA) catalyst cathodes for applications in metal-CO2 batteries and CO2 electrolysers. Ab initio HEA design will be conducted with the development of advanced electrochemistry modelling tools. This project will provide insights on interfacial reactions and establish design protocols. The anticipated outcomes would transform materials and electrochemistry technologies, while providing fundamental knowledge for commercialisation. This project will put Australia at the forefront of intelligent energy materials design for combating global energy crisis and resolving climate change, by introducing safe and inexpensive batteries to the future Australia's green energy ecosystem.					
	National Interest Test Statement					
	High-entropy alloys (HEAs) are a new class of materials with superior capacity and durability in chemical catalysis and energy storage. Because HEAs can consist of five or more elements, the possibilities for discovery and design of new HEA catalysts are huge. This project aims to develop new HEA catalysts for metal-CO2 batteries with improved efficiency in producing electricity and converting CO2 into fuels. Using advanced atomic simulations and new computational approaches, this project expects to produce fundamental knowledge on key reaction mechanisms and properties at the interfaces, which are important for practical battery and electrolyser applications. With a capability to design and develop robust HEA catalysts purely from simulations, this project is expected to generate new knowledge in materials science and electrochemistry. The benefits include a quicker and more cost-effective material's design and engineering process for Australia's energy and chemical industries. Project outcomes will be disseminated via articles, conferences, and workshops, with patenting of commercially valuable IP in collaboration with industry. Through the adoption and commercialisation of this research, this project will assist Australia to achieve significant economic and environmental benefits, and contribute to meeting its 2050 net zero target, by providing breakthroughs in energy conversion and storage technologies.					
DE250101196	**Improving face identification by human-algorithm teams**	77,873.50	158,652.00	161,557.00	80,778.50	478,861.00
Carragher, Dr Daniel J	This project aims to investigate whether humans can use facial recognition technology effectively to assist in face identification tasks. Using innovative experimental methods from cognitive psychology, this project will test the technology-assisted face identification accuracy of humans under many varied conditions, generating vital new knowledge about face identification and the way humans use automated decision-aids. Expected outcomes include developing world first methods to improve technology-assisted face identification accuracy and creating evidence-based recommendations for effective human use of this important technology. Improving identification accuracy could significantly benefit society by reducing crime and wrongful arrests.					
	National Interest Test Statement					

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	Humans are using facial recognition systems to help identify individuals, but while these systems are generally very accurate, they still make mistakes. In theory, the human user is supposed to correct any errors before they are acted on. But humans are surprisingly bad at identifying unfamiliar faces, making error detection a challenging task. Identification errors – like mistaking two different people to be the same person - lead to terrible consequences, including identity crime (estimated to cost the Australian economy $3.1bn annually), and the arrest of innocent civilians for crimes they did not commit. This project will investigate the accuracy of identification decisions made by humans when assisted by facial recognition systems, addressing a glaring gap in our understanding of how well this technology works alongside human judgment. This research will develop methods aimed at improving the identification accuracy of humans when using facial recognition technology. Findings will be shared with law enforcement agencies and industry groups that already use this important technology to aid their decision-making, to potentially influence and improve the way these systems are used. These findings may also shape future government legislation related to facial recognition technology. By improving our understanding of the way humans use facial recognition technology, this project has the potential to make our society safer by reducing crime and protecting civil liberties.					
DE250101335	**Safe collaborative control for heterogeneous multi-agent autonomous systems**	79,948.50	151,397.00	142,897.00	71,448.50	445,691.00
Yan, Dr Bing	This project aims to develop safe and effective collaborative technologies combining control and learning for diverse autonomous entities, adapting to complex and hazardous environments. It expects to contribute to the fields of control systems, robotics, and reinforcement learning. Expected outcomes include novel collaborative anomaly analysis, optimal task allocation, and safety-critical control methods that address two fundamental limitations in the state-of-the-art: sustained safety in complex environments and efficient collaboration among energy-limited various entities. This should provide significant benefits, such as intensifying harmonious collaborations among ground vehicles and drones for disaster response and transportation.					
	National Interest Test Statement					
	Australia's need for innovation in autonomous systems is driven by its low population density and high labour costs. These systems are essential in critical industries, replacing humans in high-risk and high-efficiency-demand tasks, such as disaster response and intelligent transportation. The complexity of these tasks requires various types of autonomous systems, managed by advanced control technology for effective collaboration. However, challenges to collaborative safety in the form of cyber-attacks or physical failures hinder their broader implementation in complex real-world environments. By combining control and learning for diverse autonomous systems, the project will develop ground-breaking collaborative control methods, offering sustainable stability and autonomy with much improved safety and efficiency compared to conventional autonomous systems. It directly benefits Australians by improving safety in hazardous environments and optimizing logistics operations, through the development of ground-air collaborative unmanned prototype systems for typical scenarios in Disaster Response and Logistics. Working with potential partners, such as the Department of Infrastructure and Transport and Australia Post, we aim to develop better solutions for real-world applications. We will also promote the project's research outcomes through publications and media to reach a wider audience, engaging the broader community and industry stakeholders.					
DE250101463	**Preparing Australia for a fiery future: Five strategies to guide law reform**	79,973.00	160,046.50	161,522.00	81,448.50	482,990.00
McCormack, Dr Phillipa C	Australia does not have the necessary legal frameworks to proactively mitigate bushfire risks. This project aims to support effective, equitable, and timely fire mitigation through law reform. By pioneering holistic assessment of adaptation in state fire laws, and drawing novel insights from international case studies (Canada, Spain and USA) and active stakeholder input, expected outcomes include practical pathways for law reform and new international networks for exchanging knowledge. Outputs to guide more effective implementation of evidence-based legal reform are expected to assist policy makers to enact improved fire prevention, benefitting fire agencies, communities, and ecosystems to thrive in a future increasingly defined by fire.					
	National Interest Test Statement					
	Australia is a fire-prone continent. Fire seasons are getting worse and, in the coming years, more people will die, homes will burn and local and regional economies may collapse. Australia's bushfire laws and policies are supposed to help governments and communities prevent catastrophic fires and protect people, nature and economies, but these laws are criticised as ineffective, too complex, and too heavily focused on the past instead of helping us to adapt to a changing future. This project aims to address a significant knowledge gap by examining what better bushfire laws would look like in Australia. It will (i) assess how existing laws could better support adaptation to more severe bushfires; and (ii) map pathways from where we are now, to the better, future-oriented laws that we need. This project offers substantial benefits to Australian governments, public and private land managers and natural environments. By directly informing legal reforms to help Australians better prepare for future fires - through submissions, workshops and a detailed online compendium - this project will provide tailored support to develop laws that protect people, nature and economies. This project will engage with governments and experts in Australia and overseas through workshops, interviews and detailed submissions to government inquiries, and capitalises on a strong appetite for legal reform to tackle this urgent national priority of promoting adaptation to an increasingly flammable future.					
	The University of Adelaide	774,689.50	1,526,984.50	1,505,990.00	753,695.00	4,561,359.00

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University of South Australia						
DE250100528 Akbar, Dr Skye	**Collaborative Trust Marks: Marketing Aboriginal Tourism** Using community-based participatory action research, this project works with Aboriginal tourism stakeholders, developing marketing knowledge, to improve consumer participation. The project will generate new knowledge on how to use market-based assets to increase participation in Aboriginal tourism. Expected outcomes of this project include modelled collaboration on collective marketing, understanding how to nudge consumers towards participating, and advice for policy makers on supporting Aboriginal tourism growth. Benefits of this research will include supporting Aboriginal tourism operators, advice for tourism industry policy makers, and supporting Aboriginal economic participation. **National Interest Test Statement** For thousands of years, Aboriginal people traded in local and intercontinental economies. Today, many Aboriginal tourism operators in Australia are ready for tourists. Yet, while many Australians are keen to engage in Aboriginal tourism, not many are doing it. This project will use a collaborative community participatory research approach with Aboriginal tourism stakeholders to address this issue. Guided by a steering committee of stakeholders, first the project will determine a collaborative approach to marketing that works for Aboriginal tourism operators in remote areas. Next it will work with operators to develop and implement marketing strategies aimed to increase marketplace trust and encourage participation in Aboriginal tourism. Finally, the project will develop a way to evaluate when collaborative trust marketing strategies have been impactful. Research shows that Aboriginal businesses employ more Aboriginal people, therefore, supporting Aboriginal tourism operators in their work will support Aboriginal people and communities working towards self-determined economies. The processes and outcomes of this work will be communicated through local gatherings, national conferences, engagements with policy makers, and in academic journals. These outcomes align with Australia's Closing the Gap targets, commitments to Sustainable Development Goals, and United Nations Declaration on the Rights of Indigenous Peoples.	78,832.00	154,653.50	149,448.50	73,627.00	456,561.00
DE250100568 CAI, Dr Wei	**Innovative Fire-Resistant Composite Coatings for Steel Structures** This project focuses on creating innovative fire-resistant polymer composite coatings to mitigate fire risks in steel structures. Leveraging interdisciplinary methods, it aims to pioneer fire-resistant coatings and establish a thorough understanding of fire hazard prevention in steel structures. Anticipated outcomes encompass the development of cutting-edge fire-resistant materials and novel insights into protective coating methodologies. This research is poised to significantly benefit the Australian coating and steel industries, while crucially safeguarding the lives and properties of Australians against fire hazards. **National Interest Test Statement** Despite many advantages of steel structures, fire hazards are currently emerging in Australia due to steel's weak resistance to fire, with the high temperatures causing serious deformation and collapse disaster. Therefore, there is an urgent need to provide new strategies and solutions to tackle these fire hazards. Using interdisciplinary approaches, this project will develop innovative and fire-resistant coatings to maintain the mechanical strength of steel constructions when exposed to fire by forming an insulated and mechanically robust ceramic layer. This will hinder the fire and give more time for escape and rescue efforts. The benefits of this project include ensuring the safety of personnel and buildings in a fire, giving more rescue time to protect and save lives and property, boosting Australia's coating and steel industries and reinforcing Australia's research strength in advanced materials and safe technologies. To promote uptake, the project results will be presented at trade conferences and via direct engagement with Australian steel, polymer and coating industry specialists.	81,428.00	162,743.00	162,702.50	81,387.50	488,261.00
	University of South Australia	160,260.00	317,396.50	312,151.00	155,014.50	944,822.00
	South Australia	1,339,222.00	2,650,546.50	2,617,011.00	1,305,686.50	7,912,466.00

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Tasmania						
University of Tasmania						
DE250100098	**Southern Ocean Heat Fluxes: Melting Ice and Global Oceanic Circulations**	76,033.50	152,162.50	154,058.00	77,929.00	460,183.00
Doddridge, Dr Edward W	This project aims to understand what controls the transport of heat polewards to the Antarctic margin. This heat transport determines the rate at which ice shelves melt, and thereby controls the Antarctic contribution to sea level rise. Expected outcomes of this research include a tool for near-real-time estimation of the Antarctic overturning circulation and accurate projections of future ocean heat transport in a changing climate. The project will provide a step-change in our understanding of the Southern Ocean. The results will provide vital information for policy makers and the general public on the future of this crucial region and its impact on Australian and global climate, sea level rise, and Antarctic sea ice.					
	National Interest Test Statement The ocean transports heat towards Antarctica. This heat transport controls the Antarctic contribution to sea level rise. The response of the Southern Ocean to climate change remains highly uncertain. This project will address this fundamental research gap and elucidate the processes controlling the transport of heat polewards, and provide robust projections for how this transport will change in the coming decades and centuries. Recent research suggests that the Antarctic overturning circulation, a vital current that transports heat, salt, and nutrients around the globe, is slowing down. However, due to a lack of measurements, we lack the ability to characterise these changes. This project will develop a tool for the near-real-time estimation of the Antarctic overturning circulation, providing an early warning signal for changes to this vital ocean current. Improved projections of ocean heat transport and temperature will inform fisheries policy and management. More accurate sea level rise and climate projections will benefit federal, state and local governments and planners, while protecting Australian sectors vulnerable to climate extremes, including coastal communities, agriculture, water management, and tourism. Results will be of particular value to agencies involved in fisheries, sea level rise policy and weather and climate forecasting, including the Australian Fisheries Management Authority, Australian Antarctic Division, and Bureau of Meteorology.					
DE250100147	**Assessing impacts of ocean warming on carbon export in the Southern Ocean**	81,230.50	156,959.00	153,897.00	78,168.50	470,255.00
Ratnarajah, Dr Lavenia	Marine zooplankton consume ~75% of phytoplankton primary production and play a major role in the biologically mediated export of carbon into the deep ocean. Despite their importance, the cycling of carbon by zooplankton is the largest source of uncertainty in global climate models used by the Intergovernmental Panel on Climate Change (IPCC). This DECRA project will apply a suite of laboratory and field-based approaches, and numerical models, to quantify zooplankton grazing dynamics and carbon export in the Southern Ocean under current and future ocean temperatures. Results from this study will be used to improve how zooplankton are represented in global climate models to better predict changes in marine carbon cycling in a changing climate.					
	National Interest Test Statement Zooplankton are a diverse group of microscopic animals that account for ~40% of the ocean's biomass and play a key role in oceanic carbon export. Despite their importance, quantitative observations are sparse and zooplankton represent the largest source of uncertainty in global models of the ocean carbon cycle. This project will assess how ocean warming influences zooplankton driven carbon export for the three main zooplankton taxa in the Southern Ocean-copepods, salps and Antarctic krill. Data generated here will be used to improve zooplankton representation in global models in time for the World Climate Research Programme Coupled Modelled Intercomparison Project (CMIP8) exercise. Whilst other zooplankton taxa are not commercially harvested, Antarctic krill are the target of the Southern Ocean's largest fishery. Fishery-driven declines in krill biomass could result in opposing effects on the carbon sink. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has emphasised the need for information on the role of krill in biogeochemical cycles. There is a forthcoming revision of the krill fishery management strategy, and as a CCAMLR Member, Australia plays a major role in modelling sustainable catch limits. This project will also quantify the impacts of krill fishing and ocean warming on Antarctic krill mediated carbon export for the Southern Ocean. Results from this study will be submitted to CCAMLR deliberations to aid in krill fishery management.					
DE250100589	**Helping Citizens Share Responsibility for Democratic Climate Adaptation**	81,426.00	162,526.50	162,442.00	81,341.50	487,736.00
Lucas, Dr Chloe H	This project will create new tools to help citizens participate in democratic dialogue about climate change adaptation. Climate change impacts the lives of Australians, including through more frequent and intense bushfires, floods, heatwaves, droughts and storms. However, most citizens are not given the opportunity to be involved in government decisions about how to plan for and manage these risks. This project explores games and play-based forms of group deliberation as ways to engage a wide range of citizens in setting agendas for climate adaptation policy and planning. It will identify diverse perspectives and priorities, and					

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	start place-based conversations between citizens and governments about how to thrive in a climate-changed world. **National Interest Test Statement** Many Australians face uncertain futures because of the impacts of climate change, with increasing risk from extreme weather events and sea level rise. People already experiencing social disadvantage are likely to be worst affected. This action research project aims to help citizens to envision ways to thrive in a climate-changed world. It will enable them to prioritise the kinds of climate adaptation activities that are important to their communities, and to work together with local, state and federal government representatives to map out place-based actions that will contribute to thriving futures. The project will investigate how accessible and entertaining game-based methods can be used to engage a diverse range of citizens, including those who are socially disadvantaged, and those who are under-represented in research and policy. The project will benefit Australian society by developing tools to strengthen civic engagement and build trust between citizens and governments. By identifying ways to enable democratic dialogue about climate adaptation, it will empower citizens to contribute to adaptation pathways that can improve long-term social cohesion and equity in Australia.					
DE250100733 Jansen, Dr Jan	**Mapping baselines and observing trends of Antarctic seafloor biodiversity** This DECRA combines biodiversity mapping, seafloor images and artificial intelligence to deliver unprecedented insight into the distribution of Antarctic seafloor biodiversity. It will allow detecting potential biodiversity trends and inform policy makers about priority areas for conservation in a time of rapid environmental change. This project will develop the world's first submersible-based monitoring project to produce an unmatched stream of Antarctic seafloor imagery, and use artificial intelligence to help bridge a crucial gap between field observations and policy impact. The new tools and unique information from this project are essential for managing the Antarctic seafloor, one of the world's most unique and pristine ecosystems. **National Interest Test Statement** Rapidly declining marine biodiversity threatens the functioning and stability of ecosystems worldwide. The highly diverse Antarctic seafloor communities provide many critical ecosystem services, including providing habitat for commercially important fish species and as a resource for pharmaceutical compounds. The conservation value of Antarctic seafloor biodiversity is therefore well recognised in science and policy. However, a lack of data on key aspects of the Antarctic seafloor ecosystem means how they respond to a rapidly changing environment remains poorly understood. This DECRA combines biodiversity mapping, seafloor images and artificial intelligence with the development of the world's first submersible-based monitoring project to fill crucial knowledge gaps that currently hinder informed management of one of the most unique and pristine ecosystems on Earth. Maps of the distribution of shallow/coastal Antarctic seafloor biodiversity will aid Australia's efforts to establish Marine Protected Areas in the waters adjacent to its Antarctic claim. Low-cost seafloor images, collected from tourist submersibles, will be of unmatched value for monitoring and will complement data collected during expensive research cruises. Automatically extracted biodiversity information from images will be rapidly reported to policy makers, supporting Australia's leadership in managing and conserving the unique Antarctic marine ecosystem.	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00
DE250100851 Armistead, Dr Sheree	**The interplay of tectonics and climate on critical minerals in deep time** Critical minerals are vital for Australia's economy and our transition to a net zero future. This DECRA aims to determine the processes required to form sediment-hosted copper and critical mineral deposits over the last billion years of Earth history. This project will integrate global scale plate tectonic models, global ore deposit datasets and regional-scale geochemistry data. Outcomes of this project will be a greater understanding of the interplay between tectonics and climate on ore deposit formation, and the identification of regions in Australia that may be prospective for sediment-hosted ore deposits. The benefits are new potential critical mineral discoveries to ensure Australia's sustainable energy into the future. **National Interest Test Statement** Australia ranks second in the world for resources of copper and cobalt—metals that are vital for our economy and renewable energy technology—and are concentrated in sediment-hosted ore deposits. The discovery of new ore deposits in Australia is rapidly declining, while the demand for critical minerals is increasing. New approaches and methodologies are urgently needed to make new discoveries to meet this demand. One of the critical knowledge gaps in sediment-hosted ore deposits is how tectonic and climate processes interact to form these deposits. This DECRA project will integrate the recently published global plate tectonic model of the Earth over the last billion years with global databases of ore deposits, sedimentary basins and regional-scale data to understand the links between tectonics, climate and ore deposit formation. This will identify regions in Australia that are prospective for sediment-hosted ore deposits. The methods developed in this DECRA are likely to be used by government geological surveys and industry to guide future exploration strategies. The outcomes of this DECRA directly relate to two focus areas of the Australian Government Critical Minerals Strategy: 1) developing strategically important projects, and 2) attracting investment and building international partnerships. This strategy was developed partly in response to the Australian Government's 2022 announcement, which legislated Australia's greenhouse gas emissions reach Net Zero by 2050.	81,271.00	162,654.50	162,672.00	81,288.50	487,886.00
DE250101025	**Rate-induced transitions and recovery in systems with delayed feedback**	73,535.50	154,726.50	162,241.50	81,050.50	471,554.00

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Quinn, Dr Courtney R	Delayed feedback occurs naturally across many fields of study including biology, epidemiology, neural networks, ecology and climate. Within such complex systems, the change in environmental conditions can lead to catastrophic outcomes. The phenomenon of rate-induced transitions (the failure to track a stable state due to critical rates-of-change) is not well studied in delay systems. This project will extend the theory as well as explore practical applications in real-world systems, particularly those motivated by climate and ecological processes. It will shed a light on how increasing rates-of-change in environmental factors could affect the long-term behaviour of critical issues such as the El Nino Southern Oscillation and Varroa mites. **National Interest Test Statement** Our climate is changing at an ever-increasing rate. Temperatures are rising, ice caps are melting, and extreme weather events are threatening both land and sea. The rates of such changes impact the potential consequences, and the complexity of natural systems involves many feedback effects. Mathematically feedback is represented by delay, e.g. temperature at the current time is dependent on temperature at a past time, where all processes in between are captured by the delay. This project will explore the consequences of different rates-of-change on delayed feedback processes in both climate and ecological systems. The aim is to extend the theory of rate-induced transitions in delayed systems both through analytical work and case studies. The results will be beneficial to researchers and stakeholders alike – with applications linked to the El Nino Southern Oscillation and the Varroa mite outbreak, there will be valuable impact in understanding how rapidly changing environmental factors affect such pressing socioeconomic issues.					
	University of Tasmania	474,945.00	951,926.00	958,207.50	481,226.50	2,866,305.00
	Tasmania	474,945.00	951,926.00	958,207.50	481,226.50	2,866,305.00

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Victoria						
Deakin University						
DE250100078	**Understanding how refugees use digital technologies during resettlement**	67,090.00	146,509.00	155,374.50	75,955.50	444,929.00
Ratnam, Dr Charishma	This project aims to investigate how refugees use digital technologies to navigate resettlement in Australia. Taking the case of Sri Lankan refugees, and integrating robust digital and ethnographic methods, this project will generate new knowledge on how refugees use smartphones and digital applications to address their material and social needs in order to successfully resettle. Expected outcomes include an empirical evidence-base about refugees' everyday digital practices, and advanced research capacity in digital migration and refugee studies. Benefits include guidance for service providers on how digital technologies can be integrated into programs to improve the resettlement outcomes of refugees in Australia.					
	National Interest Test Statement					
	This project aims to investigate how refugees use digital technologies to navigate resettlement in Australia. Doing so is important to address social needs as well as the material needs of housing, employment, and English language acquisition. International evidence demonstrates that digital technologies have transformative effects for refugees, but the current focus on teaching basic digital literacy skills in Australia limits understandings of how refugees with proficient skills use smartphones and digital applications to successfully resettle. The project will integrate digital and ethnographic methods to address a critical gap in knowledge by focussing on the everyday digital practices of refugees. This in turn will generate new knowledge on exactly how digital technologies are used on a daily basis and for what purposes. The research will provide a platform for refugees to share resettlement experiences and will benefit settlement services and migrant resource centres delivering resettlement programs. This project will position Australia as a global leader in providing resettlement programs that equip refugees with the contemporary skills and knowledge they need to flourish. Outcomes will be shared through key insights reports, a public forum event, and input to government consultations, such as the Departments of Home Affairs and Social Services.					
DE250100122	**Enabling Australian aluminium recycling with rapid solidification**	73,895.50	151,320.00	157,529.00	80,104.50	462,849.00
Jiang, Dr Lu	Existing metal recycling processes accumulate impurities that degrade aluminium alloys, reducing the value of scrap recycling. This project will investigate and assess the efficacy of rapid solidification of molten liquid metal to enable Australian recycling of high-value aluminium scrap. Expected outcomes include a new understanding of how impurities affect the microstructure and properties of rapidly solidified high-performance aluminium alloys and enhancing impurity tolerance without sacrificing alloy properties. Benefits include advancing metallurgical science, creating local industry opportunities for valuable resource recovery, securing alloy supplies, reducing environmental footprint and boosting the aluminium circular economy.					
	National Interest Test Statement					
	Over 95% of Australia's raw aluminium scrap metal is exported to make lower-value products or sent to landfill because it is too costly to separate and purify. Scrap high-performance aluminium recycling is challenging due to impurities introduced during recycling that damage the properties and longevity of these valuable alloys. With rapid solidification techniques, which rapidly cool liquid metal into a solid, this project will create the necessary knowledge for new industrial opportunities to create new aluminium alloys from scrap materials with high impurity tolerance. These novel recycling-friendly aluminium alloys will be patented and commercially evaluated by local industries. To maximise impact and foster innovation, findings will be disseminated through academic publications, industry partnerships, international scientific events and public outreach. The outcomes will boost Australia's recycling industry by creating sovereign high-performance aluminium alloys through local supplies that are secure against disruption, reduce waste going to landfill and significantly lower the high energy consumption and carbon emissions resulting from alloy production from virgin sources. These benefits will give Australia a growing reputation as a frontrunner in the battle against climate change and resource depletion and strengthen Australia's sovereign alloy sources for high-value aluminium manufacturing.					
DE250100269	**Unravelling chiral recognition to improve sensing and separation efficiency**	79,340.00	157,323.50	157,392.00	79,408.50	473,464.00
KONG, Dr NA	Chiral molecules, analogous to our hands, appear similar but don't match exactly. Accurate identification of these molecules is crucial as the two different forms can have dramatically different functions, which can mean the difference between a drug helping or harming. This project will explore chiral interactions using an integrated single-entity electrochemistry approach. Investigating these interactions in real-time will reveal fundamental mechanisms of chiral recognition, enabling the ability					

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	to control surface chiral affinity. The project will benefit Australia by inventing effective detection and separation technologies for certain chiral molecules, hence improving the purity and efficacy of medicines, agriculture, and food products. **National Interest Test Statement** In chemistry, chiral molecules have identical molecular formulas, atom-to-atom connections, and bond lengths as their mirror-image counterparts. Surprisingly, these seemingly identical structures result in distinct properties and can lead to different biological effects. Consider Thalidomide, a drug administered to pregnant women in the past. One version alleviated morning sickness, while the other caused severe birth defects. Despite these consequences, efficient detection and separation methods for chiral molecules are progressing slowly due to lack of understanding of chiral recognition mechanisms. This project aims to uncover the fundamental mechanisms of chiral recognition at the molecule level. It employs an innovative real-time electrochemical Raman spectroscopy technique, poised to significantly improve our ability to accurately identify and separate chiral molecules. This advancement will transform product purity, safety, and efficacy. These capabilities are crucial for ensuring the quality and safety of pharmaceuticals, optimising agricultural practices and monitoring environmental pollutants. The knowledge generated by this project will directly benefit research in health, environmental science, biotechnology, and related industries. By providing practical solutions to domestic industries and disseminating outcomes through conferences and media, this project makes a substantial contribution to Australia's global leadership in science, innovation, and technology.					
DE250100306 Pullabhotla, Dr Hemant K	**Quantifying the long-term economic impacts of bushfire smoke in Australia** The project aims to provide a new understanding of the long-term economic cost of bushfire smoke in Australia. Individuals exposed to bushfire smoke suffer adverse economic outcomes due to multiple channels. To date, the data and methods available have been insufficient to evaluate long-term effects and inform an appropriate policy response. This project leverages recent data advances and builds upon methods employed in my past research to provide a new empirical method for risk profiling of long-term smoke exposure and to generate an improved understanding of the associated economic costs. The findings would aid government agencies, fire services, and local communities in re-evaluating bushfire management practices. **National Interest Test Statement** Australia has experienced some of the worst bushfires in recent years. Since 2000, nearly half a million square kilometres have burned annually, on average. In addition to direct fire damage and other destructive losses, bushfire smoke has also been linked to multiple adverse economic and health outcomes in the short term. However, our knowledge of the overall economic costs of bushfire smoke exposure needs to be improved, particularly the lasting, accumulated long-term effects, which need to be better understood. The project will generate estimates of the long-term impacts of bushfire smoke exposure on individual earnings and quantify the cost to the Australian economy. The project will also identify those sections of the population most vulnerable to bushfire smoke exposure and determine the economic impacts for these subgroups. The project will benefit the Australian economy more broadly by enabling the government, environmental agencies, fire management services and local communities to re-evaluate bushfire management strategies and practices based on an improved understanding of the longer-term risk factors. To aid decision-making, the project outputs include a publicly available geospatial data portal providing information on smoke exposure across Australia and a series of workshops with key stakeholders to communicate the research findings.	75,385.50	155,243.50	160,819.00	80,961.00	472,409.00
DE250100355 Le, Dr Hung	**Complex Time-series System Forecasting Reinforced by Expert Knowledge** This project aims to predict complex behaviours of multiple interconnected data streams, introducing a new forecasting framework compatible with big data and domain knowledge. It expects to provide actionable insights for informed decision-making, fostering the development of robust forecasting models crucial for Australia's leadership in the global AI era. Anticipated outcomes include more accurate predictions in critical domains like healthcare, potentially saving lives, and material science, expediting material discovery. The project should advance time-series prediction research, contributing to economic growth, environmental benefits, improved social well-being, and fostering commercial growth via innovative forecasting capabilities. **National Interest Test Statement** Time-series forecasting--using computers to predict future values based on past data--plays a crucial role across industries from manufacturing to healthcare. Statistical methods and even recent big-data models face difficulties when dealing with complex time-series systems featuring multiple data streams. This project seeks to overcome these challenges by creating a framework that utilises adaptive forecasting and integrates domain knowledge. By enhancing efficiency and productivity across sectors like agriculture, energy and manufacturing, this project has the potential to deliver substantial economic and environmental impacts. For instance, the project's time-series forecasting can accelerate the discovery of novel materials for electric car batteries designed to meet the huge projected global market for sustainable, high-performance energy storage. By delivering better services and interventions in areas like healthcare and social welfare, this project has the potential to improve the quality of life for Australians. For example, application of the project’s time-series forecasting for COVID-19 mortality could have potentially prevented many excess deaths by enabling timely and effective pandemic responses. The DECRA candidate will collaborate with industry partners to implement the forecasting engine,	71,388.50	142,777.00	142,777.00	71,388.50	428,331.00

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	develop open-source time-series forecasting tools, and engage with professional networks to promote the adoption of these tools in practical applications.					
DE250100822	**Where, when and how do birds sleep in the city?**	81,442.50	162,533.00	162,538.00	81,447.50	487,961.00
Aulsebrook, Dr Anne E	This project aims to investigate changes to avian sleep in response to urbanisation. Using state-of-the-art monitoring techniques, the project expects to identify environmental conditions that are necessary for sufficient sleep in native birds. By combining field research, experimental studies and broader comparisons across species, the project will determine the capacity of different populations and species to tolerate or adapt their sleep to changing environments. The results will address a gap in our understanding of animal behaviour in cities, allowing us to identify vulnerable populations and species, develop new strategies for pest management, and work with governments and communities to inform habitat management and urban planning.					
	National Interest Test Statement Promoting native birdlife in cities has important benefits for conservation, ecosystem health, and human wellbeing. However, urban environments can also deter birds and cause them harm. Although most of us appreciate the importance of sleep in our own lives, we rarely consider whether or how sleep loss affects wildlife. This project will determine, for the first time, the extent to which native Australian birds avoid, tolerate or adapt to effects of urbanisation on sleep. By identifying where wild birds choose to sleep, as well as the consequences of these choices, this project will inform new strategies for protecting and restoring urban biodiversity. The project will determine whether Australian birds can adapt to increased disturbance and sleep loss, facilitating better predictions of the short- and long-term effects of human disturbance on populations. Through cross-species comparisons, this project will also assess how species traits (e.g. diet) predict responses to environmental change. Results will be shared with local governments, land managers and Australian communities through workshops, public seminars, media outreach and freely-available articles. The project will deliver environmental, social and economic benefits to Australian cities and their inhabitants, including benefits for urban biodiversity, ecosystem health, ecotourism, and improved coexistence of humans and wildlife.					
DE250100873	**Modelling the energy transition: the making of socio-technical futures**	62,611.50	128,951.50	132,536.50	66,196.50	390,296.00
Adams, Dr Sophie M	This project aims to investigate how energy system planning and modelling processes are increasingly being used to guide the complex renewable energy transition underway in Australia. By drawing on theory and methods in the social sciences, this project will generate insight into the social implications of the alternative future pathways under consideration. Expected outcomes include recommendations to support decision-making to ensure social equity and public trust is maintained through the transition, and the development of an innovative methodology to engage the public in deliberating the future of the energy system. This will help to achieve a smoother transition to a renewable, affordable and reliable power system.					
	National Interest Test Statement The renewable energy transition underway in Australia must ensure reliable, affordable access to electricity for all Australians while meeting the nation’s commitment to net zero carbon emissions. Energy system planning and modelling processes are increasingly used to select pathways that balance these complex and competing objectives. This project aims to understand how these processes are shaping the future of the energy system. It takes a social scientific approach to focus on the social aspects of the alternative future pathways under consideration, which are typically excluded from dominant technical and economic decision-making frameworks. This includes investigating how social values and assumptions are embedded in these future pathways and the implications of different pathways for social equality and public trust. The project will also develop a novel participatory method to engage members of the public in considering the desirability, plausibility and potential trade-offs of alternative future pathways. By developing insights into the social aspects of the renewable energy transition and exploring the potential for greater democratic engagement, this project will help to achieve a smoother transition with economic, environmental and social benefit for all Australians. These insights will be shared with government and energy sector stakeholders through a report, webinars and presentations at industry conferences.					
DE250101396	**Responding to the harms of ultra-processed foods in Australia**	77,948.50	155,897.00	155,897.00	77,948.50	467,691.00
Pereira Machado, Dr Priscila	This project aims to develop strategies to increase public awareness of the harms of ultra-processed foods in Australia. Ultra-processed foods make up nearly half of Australia's diet, with highest intakes among the youth and the most disadvantaged. Despite the surge in their intake each year, many consumers remain unaware of their detrimental effects. This project will develop a framework to guide stakeholders in tailoring messages to reduce ultra-processed food consumption, and create a novel warning label for ultra-processed food packaging to help consumers identify these foods. Outcomes will deliver significant benefits by informing strategies and policies to reduce the societal harms linked with ultra-processed foods consumption.					

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	National Interest Test Statement This project aims to develop strategies to increase public awareness of the harms of ultra-processed foods in Australia. Despite their detrimental effects on human health, the environment, cultures, and the economy, sales of ultra-processed foods are increasing each year. These foods constitute nearly half of Australians' diet, with highest intakes among the youth and the most disadvantaged. Ultra-processed foods include not only 'junk foods' (e.g., soft drinks, fast food) but also many items that consumers may not perceive as unhealthy (e.g., sliced breads, frozen meals, and flavoured yoghurts). Approximately ¾ of ultra-processed foods have >2.5 health stars on their packages, which can contribute to consumer confusion. Using innovative research methods, this project will generate evidence on consumers' understanding of ultra-processed foods that will inform a framework to guide stakeholders in tailoring messages to reduce ultra-processed food consumption in Australia. Additionally, this project will develop and test a new warning label for ultra-processed food packages to help consumers easily identify these products. This has potential to increase the literacy of the Australian population and public support for policies targeting ultra-processed foods to ultimately reduce their intake. The project includes strong engagement with consumers and stakeholders, including in the development of a communication toolkit, to optimise its relevance and translational impact.					
DE250101419 Zorbas, Dr Christina	**Collaborative Food Security Solutions among Migrant Populations** This project aims to identify policy priorities to combat food insecurity amongst Australia's migrant and refugee communities in the current cost-of-living crisis. Collaborating with researchers, governments and local communities, the project expects to generate new data, community engagement, and policy implementation tools on food insecurity policies. Expected outcomes include new routine monitoring of food insecurity among migrant and refugee communities. Additional outcomes include strategies to instil community perspectives into food insecurity policy decisions. This should provide significant benefit through enhancing social, economic and cultural equity in Australia by accelerating policy actions to reduce food insecurity.	80,500.00	160,140.50	161,002.50	81,362.00	483,005.00
	National Interest Test Statement There has been a global rise in food insecurity since 2019, with 42% of the world's population unable to afford sufficient nutritious food. In Australia, 35%-90% of refugee communities experienced food insecurity prior to COVID-19. Currently, we do not have data on the true extent or diverse experiences of food insecurity amongst most migrant and refugees – a major barrier to advancing effective food insecurity policies. This project aims to promote social equity in Australia by pioneering a co-design approach to actively involve migrant and refugee communities in identifying practical food insecurity solutions. Culturally sensitive data collection tools will be developed and community lived experiences will be integrated into food policy decisions. This research will directly connect migrants and refugees with government and non-government sectors working to address food insecurity. This will strengthen multisectoral partnerships and result in aligned actions to effectively reduce food insecurity across migrant and refugee communities. Results will be shared through policy journals, annual forums, policy briefs for civil society, parliamentarians, and public servants, and mainstream media such as the ABC. By developing pathways towards implementing culturally sensitive food insecurity policies during the cost-of-living crisis, the project will provide significant social, cultural and economic benefits for all Australians.					
	Deakin University	669,602.00	1,360,695.00	1,385,865.50	694,772.50	4,110,935.00
La Trobe University						
DE250100006 Gionfriddo, Dr Caitlin M	**Solving a mercurial mystery: the evolutionary origin of mercury methylation** This project aims to investigate the evolutionary origin of microbial mercury methylation, testing a possible link with arsenic resistance. This project expects to generate new knowledge in the areas of biogeochemistry and microbial genetics using a multi-omics approach to explore why microbes produce this more toxic form of mercury. Expected outcomes include expanding our understanding of the biochemical mechanism of mercury methylation and improving predictions of the production and accumulation of this toxin in aquatic ecosystems. This should provide significant environmental benefits, such as informing Australian regulation of mercury emissions, limiting the toxic effects of mercury on humans and wildlife, and its burden on food safety.	81,187.00	162,026.50	161,664.50	80,825.00	485,703.00
	National Interest Test Statement This project aims to determine how and why microbes produce a more toxic form of mercury, called methylmercury, in freshwater ecosystems. Methylmercury is of public and environmental health concern as a neurotoxin, and the impacts of contamination on human health and the environment cost the Australian economy ~$52.7 million a year. A major challenge in efforts to reduce the environmental impact of methylmercury is a lack of comprehensive understanding of the processes that control its production by microbes. By determining the biochemical mechanisms of mercury methylation, this project will inform management strategies to minimise mercury's adverse impacts on food webs and public health. A key outcome will be the development of reliable tools for predicting the long-term risks of legacy mercury contamination on Australian freshwater ecosystems. Research findings will be communicated to environmental managers, government and industry through publications, presentations, and open-source repositories. This will enable broad adoption of outcomes by mercury-					

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	emitting industries and federal regulators. This project will help safeguard aquatic environments against mercury contamination and assist Australia's commitment to the Minamata Convention on Mercury that aims to protect human health and the environment from mercury. The project findings will also be communicated to the broader public via media releases, social media and through our industry partnerships.					
DE250101154	**Connecting Pasifika Communities to the Collections made by James Lyle Young**	65,448.50	130,897.00	130,897.00	65,448.50	392,691.00
Richards, Dr Michelle J	An innovative combination of new scientific techniques and creative methods for engaging with Pacific (Pasifika) communities aims to transform our understandings of the colonial legacy of 19th century museum collections. Research is of historical and social significance because Australian entrepreneur James Lyle Young, who had intensive interactions over six decades (1870-1929) with cultural groups across the Pacific, but whose consequences in framing Pacific culture for the outside world will be newly explored. A new database and innovative methodologies will yield significant benefits for Pasifika communities, regional museums, and cultural centres by connecting descendants with their material cultural heritage housed in overseas museums.					
	National Interest Test Statement Barriers created by a lack of relevant knowledge prevent Pacific communities (Pasifika) from accessing cultural materials held in overseas museum collections. These can be removed through the application of innovative archaeological research that combines participatory research with new scientific techniques. By focusing on the roles taken by Pasifika people in cross-cultural engagements with Australian businessman James Lyle Young between 1870-1929, the dynamics of colonial culture across the Pacific will be re-interpreted. The understanding of Australia's past colonial role in the Pacific may inform and significantly enhance its contemporary role, especially by reconnecting distant Pasifika communities with their ancestor's material culture, including diasporas and those displaced due to climate change. A co-designed exhibition and a digital open access cultural database will reconnect, engage and provide avenues for Pasifika communities to reclaim ownership of their cultural material. Clear social and educational benefits will be also delivered to Pasifika communities through educational resources and contribution to policy designed to bolster cultural identities and wellbeing. By creating new avenues for cross-disciplinary and international collaborations with creative engagement methods in museums and cultural centres, the results of this project are intended to reach a wide public audience and be made accessible for future generations.					
	La Trobe University	146,635.50	292,923.50	292,561.50	146,273.50	878,394.00
Monash University						
DE250100024	**Hydrogen Hub Futures**	81,433.50	162,804.00	162,804.00	81,433.50	488,475.00
Dahlgren, Dr Kari L	This project aims to assist Australia's developing hydrogen industry deliver its potential decarbonization, economic and social benefits, by critically examining the hydrogen hub model and its impact on regional communities. This project expects to generate new knowledge by being the first ethnographic study of Australia's emerging hydrogen industry. Expected outcomes of this project include enhanced understanding of the consequences of the hydrogen hub model and its impacts for regional communities, theoretical development in the social sciences of industrial decarbonisation, a documentary film for research dissemination, and policy recommendations for hydrogen development planning that take into account community concerns and desires.					
	National Interest Test Statement The development of hydrogen holds great potential for Australia in terms of boosting the economy, creating jobs, and rejuvenating export industries, all while aligning with Net Zero carbon emission targets. To facilitate rapid expansion, there are plans to establish hydrogen hubs where the production and consumption of hydrogen will be concentrated in regional communities. However, this will bring about significant changes to the way of life and landscapes in these regions. To date, there has been very limited research on the potential social impacts of the emerging hydrogen industry, and even less on how communities in hydrogen hubs can actively shape their futures. This research aims to conduct in-depth investigations in communities identified as hydrogen hubs to understand their aspirations regarding this major transition and work to ensure the hydrogen industry can effectively deliver its promised benefits while considering the unique needs and desires of the communities involved. The research will produce a documentary film highlighting the key impacts and community visions for the future of their regions as hydrogen hubs, as well as a policy report to disseminate the findings and ensure that community perspectives are not only recognized but also integrated into the planning and development of hydrogen hubs.					
DE250100030	**Generative Models for Generalised Skeleton-based Human Action Recognition**	79,180.00	160,080.50	161,801.00	80,900.50	481,962.00
Ke, Dr Qiuhong	This project aims to develop innovative techniques rooted in generative models for more generalised human action recognition using privacy-preserving skeleton sequences. This project expects to contribute new knowledge in data-efficient learning, zero-shot learning, and domain adaptation					

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	through the development of novel methods. Expected outcomes of this project include novel techniques for generating skeleton data and enhancing action recognition models, enabling models to recognise unseen actions and adapt to diverse domains with limited training data. This should provide significant benefits to science, society, and the economy nationally and internationally, through various applications such as in autonomous vehicles and healthcare. **National Interest Test Statement** This project aims to develop advanced techniques based on generative artificial intelligence (AI) for better human behaviour understanding, using human motion sequences that protect privacy. Unlike current systems that need a lot of human-collected training data and only work in specific areas, the proposed system eliminates the need for large datasets for model training and the models will be able to work in general situations where there can be unseen human behaviours or unseen scenarios. This implies that the action recognition models can reliably operate across diverse real-world scenarios. For example, it can make healthcare better by detecting falls and giving personalised exercise advice. Besides, in transportation, it can understand how people walk and behave, making self-driving cars safer. Moreover, it can be used to improve athlete training by analysing movements. This project will not only drive technological innovation but also facilitate tangible solutions that enhance safety, healthcare, and overall human well-being. The outcomes of this project will be promoted via public engagement (e.g. organising workshops, seminars and public talks), online platforms (e.g. Github and blog), open access publications and industry collaborations. This will effectively communicate and integrate the project outcomes into various sectors, maximising their impact and benefitting society at large.					
DE250100032 Wang, Dr Weiqing	**Knowledge Enriched Approach for Effective Personalization** This project aims to integrate the strength of both knowledge and data to generate effective personalization using a novel neural-symbolic machine learning approach. This project expects to solve several challenges in pure data driven approaches (e.g., data sparsity, data bias and lack of transparency) while leveraging the simplicity of heuristic-based approaches. Expected outcomes include a novel neural-symbolic approach for user modelling that is applicable to personalisation problems in a wide range of industries. This is expected to provide significant benefit to public organisations through enabling provision of personalised service by better understanding individual users (e.g., personalized learning and personalized medicine). **National Interest Test Statement** Personalised data analysis, such as e-commerce and social media, is becoming increasingly pervasive as we interact with personalised data analysis systems on an almost daily basis. Beyond these obvious applications, personalisation has potential to revolutionise healthcare, education and employment through leveraging big data to provide data-driven support. There are currently significant challenges associated with lack of transparency and minority individuals being overwhelmed by the majority due to lack of enough data that limit wide-scale application of these techniques. This project aims to develop novel personalisation algorithms to solve these long-term challenges, by leveraging both knowledge and data in a novel neural-symbolic machine learning approach. Communication and uptake of the research outcomes will benefit government and communities by providing organisations with the ability to provide more personalised services through better understanding of individual users. Through existing strong collaborations with non-profit organizations including Monash Education, Turning Point (treatment, policy and education on health), CSIRO and Alfred hospital, this work will aid in providing services to disadvantaged individuals through better understanding individual needs and adoption/uptake through policy intervention and will contribute to promoting thriving communities where individual needs can be identified and catered for.	78,500.00	151,000.00	145,000.00	72,500.00	447,000.00
DE250100257 Allen, A/Prof Kelly-Ann	**An Urgent Need for School Belonging: Meta-Analyses & Participatory Action** The project aims to address the decline in school belonging in Australia by utilising a multi-method approach. This integrates two distinct types of meta-analysis—one based on individual student data and another on qualitative research—alongside participatory action research. This project expects to generate new and applied knowledge in the area of school belonging, contributing to both theory and practice. Expected outcomes include actionable insights and approaches for educational practice, derived from stakeholder engagement. Given that school belonging profoundly influences student wellbeing, engagement, and broader societal factors like employment and further education, this project should provide significant benefits in these areas. **National Interest Test Statement** Students with a low sense of school belonging face risks like academic underperformance and poor psychosocial health. Despite advancements such as increased funding and national curricula, school belonging is declining in Australian schools, and the nation's academic standings are also falling. According to well-established research, enhancing school belonging positively impacts academic outcomes, with long-term benefits for further education, employment, and mental health in adulthood. Yet, this knowledge has not been fully applied in Australian academic settings, let alone to the specific challenges around growing mental health issues among children and adolescents. This project aims to fill this critical knowledge gap and develop a comprehensive foundation to maximise students' wellbeing and educational opportunities. Through cutting-edge methods, the project will	66,840.50	136,411.00	146,468.50	76,898.00	426,618.00

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	provide new knowledge of school belonging and identify factors that enhance or impede it. The findings will underpin the co-design of applied, evidence-based strategies and resources for nationwide implementation. To maximise national societal impact, and successful roll-out of resources the project will engage educational stakeholders, including students, educators, and parents, facilitating the translation of these strategies into actionable policies and practices across educational settings in Australia.					
DE250100287	**The origin story of immune cells: effects of the gut microbiome**	81,098.50	162,547.00	162,897.00	81,448.50	487,991.00
O'Donnell, Dr Joanne A	This project aims to investigate how the microbes that live in the gut determine how immune cells behave throughout the body. This will help us understand how gut microbes change how bodies function. By using an innovative approach that allows immune cells in the gut to be labelled and tracked, this project expects to generate new knowledge in understanding the how gut microbes and the immune system act together to alter how the body works. Expected outcomes include developing new techniques and new scientific theories to advance our understanding of gut immune cells, gut microbes and change how we study them. This work will also build new national and international collaborations to enhance national research capacity.					
	National Interest Test Statement					
	This project aims to understand how the microbes that inhabit the gut impact the immune system. We still do not understand how this happens at the molecular, cellular, and physiological levels. This project seeks to understand how diet, acting via gut microbes, determines what organs gut immune cells travel to, and how their behaviour changes within these organs. This work may form the basis for future human and livestock interventions to benefit the health of Australians. This project will develop new tools with potential for intellectual property based on a new understanding of gut immune cells and gut microbes. We will engage with key stakeholders, such as the general community and the livestock industry, through media outlets and Australian livestock stockfeed manufacturers, respectively.					
DE250100386	**Understanding structure, dynamics and function of receptor splice variants**	79,484.50	160,219.00	161,969.00	81,234.50	482,907.00
Piper, Dr Sarah J	This project aims to understand the functional role of a specific class of G protein-coupled receptors by leveraging advanced cryo-electron microscopy, mass spectrometry, and computational approaches. This project will address fundamental knowledge gaps of how different isoforms of the receptor affect its signalling behaviour. Examining the shape and conformational dynamics of receptor isoforms provides a richer understanding of their cellular function. The comprehensive structural and functional data will allow us to produce molecular movies to better communicate the dynamic receptor activation process. This should provide significant benefits to the Australian community by visualising receptor isoforms with altered physiological function.					
	National Interest Test Statement					
	Our cells need to communicate with each other and the outside world. The process of communication is mediated by miniature protein molecules on the cell surface that act as signal receptors. These receptors, however, are not all exactly the same throughout cells in the body and differ in both size and chemical properties. These differences impact how they receive and transmit specific signals which leads to different responses in the cell. To understand this process, we first need to ‘see’ it. This proposal aims to link the mechanism of changes in these receptors to their cell response in our bodies by using cutting edge imaging techniques. This study will benefit the Australian community by providing a broader understanding of these vital receptors to their diverse roles in important biological processes. This project aims to bridge the gap between the laboratory bench and the general public, by leveraging the latest developments of computational and graphics tools to communicate our scientific data. We will produce engaging and informative 3D animations of these scientific insights to be made publicly available, making our research broadly approachable by experts and laypeople alike.					
DE250100728	**Understanding Procedural Justice in Uneven Family Court Hearings**	78,722.00	158,905.00	158,981.00	78,798.00	475,406.00
Mant, Dr Jessica	This project aims to explore procedural justice in uneven family court hearings, where one party appears as a self-represented litigant. Taking a socio-legal, empirical and interdisciplinary approach to the strengths and limitations of current case management practices, it expects to integrate international evidence on self-representation to generate new knowledge about how procedural justice can be best supported in the family law context. Expected outcomes of this project include: enhanced understanding of procedural justice and a best practice protocol for uneven hearings, co-produced with family court judges. This should provide benefits to all court users through improved access to justice and court efficiency.					
	National Interest Test Statement					

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	This project will generate original data about self-represented litigants' experiences of family court processes, as well as the pressures and challenges that judges face when managing uneven hearings. This project will address an important gap by exploring how family courts can best support procedural justice in uneven hearings, where litigants' unfamiliarity with the court process often leads to perceptions of unfairness, and the assistance they require results in increased judicial workloads and delays for others in the court system. The project will produce a best practice protocol for uneven hearings, co-produced with family court judges. The adoption of this guidance will provide several benefits for Australia, through improved access to justice for vulnerable litigants in the family court system, and improved court efficiency by contributing to reduced risk of delays and re-litigation of disputes by dissatisfied litigants. This will support the wellbeing of litigating parties and the children caught up in litigation. Through written briefings and collaborative workshops, the outcomes of the study will be widely shared within the legal profession, judiciary and community legal sector in Australia to support adoption and understanding of the protocol. The findings will also be internationally disseminated to promote translation of the project findings to similar jurisdictions, such as the UK, who are also contending with the challenges presented by uneven hearings.					
DE250100833 Allen, Dr Cameron	**Modelling the social and political drivers of the net zero transition** This project aims to discover new methods for modelling technological, social, and political drivers that enable and constrain net zero transitions. This is crucial to accelerate adoption of low-carbon technologies and behaviours in key sectors yet it is not possible with existing models. The project will integrate and quantify these drivers through an innovative approach merging systems modelling with socio-technical transitions research. This is expected to enable policymakers to design net-zero policies that are cost effective and also build the social and political momentum needed to accelerate the transition in Australia. Benefits include new policy analysis tools, improved net zero strategies, and interdisciplinary collaboration.	60,371.00	127,458.50	127,660.00	60,572.50	376,062.00
	National Interest Test Statement Climate change threatens Australia's prosperity and could cost the economy $420 billion over the coming decades. If Australia can rapidly scale down its emissions, it could drastically reduce climate challenges and reap benefits of nearly 200,000 new jobs and $900 billion in added economic value. Reaching net zero will require the rapid adoption of clean technologies such as renewables and electric transport and lifestyle changes such as using public transport instead of driving. Policy support is critical to accelerate their adoption but has faced setbacks and delays in Australia due to political resistance and low social acceptance. A key problem is that the models used for policy evaluation and advice identify the most cost-effective pathways to net zero without considering important social and political hurdles or how to overcome them. This project will address this crucial gap by developing a model that incorporates a wide range of net zero technologies and lifestyle solutions along with social and political drivers and barriers to adoption. By doing so, it will guide and enable policymakers to design better strategies to overcome barriers, build momentum for change, and accelerate adoption of net zero solutions. The new knowledge generated will be shared with policymakers and the public through established partnerships, policy briefings, and media. This will support government to transition to a prosperous net-zero economy and realise its ambitious policy commitments.					
DE250100889 Chen, Dr Gongbo	**Health economic burden of bushfire smoke in Australia** This project aims to systematically evaluate the health economic burden of bushfire smoke across Australia. The significance lies in its expectation to provide precise insights into the health economic impacts of bushfire smoke, thereby informing evidence-based policies and targeted mitigation strategies. Anticipated outcomes encompass a comprehensive understanding of patterns of bushfire smoke across Australia and its health and economic implications, enhancing research capacities, and contributing to refined methods for assessing environmental impacts on public health. The expected benefits include informing policies, fostering collaborations, and offering a potential model for global regions grappling with similar bushfire challenges.	77,500.00	155,000.00	155,000.00	77,500.00	465,000.00
	National Interest Test Statement The project aims to conduct a comprehensive assessment of the health burden and economic costs associated with bushfire smoke across Australia. It will accurately quantify the expenses tied to adverse health impacts and economic repercussions resulting from exposure to bushfire smoke, while also pinpointing the populations and regions most vulnerable to its adverse impacts. By addressing this crucial knowledge gap in Australia's understanding of the overall costs of bushfire smoke, which have been exacerbated by climate change-induced bushfires, it can yield numerous benefits. This research offers a range of advantages, as it can inform policy decisions, optimize resource allocation within healthcare systems, advocate for preventive measures against future occurrences, and increase public awareness of the tangible economic consequences and societal impacts stemming from devastating bushfires. Furthermore, beyond the realm of academia, disseminating these research findings can be achieved through targeted public awareness campaigns and collaborative efforts involving government agencies. Additionally, user-friendly tools and resources can be developed to ensure broad comprehension and facilitate translation into actionable policies adopted not only by policymakers but also by healthcare professionals and the wider society.					
DE250100964 Urwin, Dr Christopher D	**Asian voyagers and First Nations people in Australia's Gulf of Carpentaria** This project aims to investigate little-known encounters between Asian voyagers and First Nations	80,550.50	160,760.50	160,458.00	80,248.00	482,017.00

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	people in Australia's Gulf of Carpentaria through new archaeological investigations and Indigenous oral histories. The project expects to generate new knowledge of how First Nations and Asian people shaped coastal sites and one another, using a combination of precise carbon dating and artefact analyses with Indonesian collaborators and utilising First Nations accounts of Asian visits. Expected outcomes include more accurate chronologies for these interactions. Social and cultural benefits include a deeper understanding of Australia's internationalised First Nations heritage and better conservation of threatened Indigenous coastal sites.					
	National Interest Test Statement Asian voyagers visited First Nations people in northern Australia long before European explorers. Yet there are large gaps in our knowledge of these encounters, including when the first visits took place and how Asian and First Nations people shaped one another. These gaps will be addressed through ethnoarchaeological investigations of poorly documented shoreline places where these people met in the southern Gulf of Carpentaria. The results of archaeological excavations and precise carbon dating will be analysed alongside rich Yanyuwa oral traditions to provide a holistic picture of past encounters. Project benefits include a reframing of Australia's encounter narrative to highlight First Nations' deep international connections with Asia. The project will deliver improved preservation of environmentally threatened coastal sites where cross-cultural encounters took place. Site conservation plans will be co-developed with the Yanyuwa Sea Rangers to directly inform their Sea Country Management Plan. Project results will help Yanyuwa Families revive contemporary cultural exchanges with people from Makassar (Indonesia), the source of many Asian voyagers. Plain English reports and local radio will be used to share the results with Yanyuwa project partners. Histories of encounter generated by the project will be translated for Indonesian and Australian readerships through online magazine articles and multilingual press releases.					
DE250101115 Barnett, Dr Anthony I	**The psychedelic revival in addiction science: A social and policy analysis** This international comparative project will explore the policy and social implications associated with the use of psychedelics as potential treatments for addiction in Australia and the UK. The project aims to: (1) explore how psychedelics are framed in drug policy for the treatment of addiction; (2) explore consumers, researchers, and policymakers' perspectives on psychedelics; and, (3) explore how psychedelics might be implemented within addiction policy and practice in the future. The benefit of the project will be to ensure that the future translation of psychedelics to practice is done in a responsible way where consumers and experts are consulted about their preferences for translation within policy and practice.	81,448.50	162,889.50	162,872.00	81,431.00	488,641.00
	National Interest Test Statement Psychedelic therapies have been labelled as a potential breakthrough future treatment for alcohol and other drug addiction. Although Australia has moved to fast track the translation of psychedelics to clinical practice, concerns have been raised about how psychedelic treatments impact the lives of people seeking treatment, and how they might benefit or harm different groups in society affected by addiction. One in four Australians will experience alcohol and other drug addiction in their lifetime and many will access treatment for alcohol and other drug addiction. There is an urgent need to ensure that the translation of psychedelics to practice is conducted in an ethical way that promotes the wellbeing of a large cohort of Australians seeking treatment for addiction. This innovative project will explore the views of consumers, clinicians, researchers and policymakers on how to translate psychedelics to practice in an ethical and socially beneficial way. The project will have economic and social benefits to Australia by improving the way psychedelic treatments for addiction are translated to healthcare and reducing the chance of unexpected harms associated with their translation. The expected outcomes of the project include helping to inform policy guidelines on psychedelic treatment, clinician education resources, and information the general public can access to understand psychedelics and addiction treatment.					
DE250101172 Healy, Dr Evan H	**How does RNA regulate gene repression?** RNA is known to have diverse roles in many areas of biology. Currently, however, the mechanisms that link RNA to gene repression are poorly understood. This project aims to address this fundamental knowledge gap by studying how RNA regulates genomic structure at repressed genes. This project will generate new knowledge in the areas of RNA biology and epigenetics through an interdisciplinary approach to combine cutting edge genomics methods with innovative structural biology techniques. Expected outcomes include the development of new methods to study nuclear RNA as well as a more comprehensive picture of the diverse mechanisms governing gene repression. This will significantly benefit our understanding of basic RNA and chromatin biology.	81,248.50	162,597.00	161,947.00	80,598.50	486,391.00
	National Interest Test Statement Genes are the blueprints for all cellular functions, and can be turned off, or "silenced" when a particular function is no longer needed. This process is common to all multicellular organisms and is critical, for example, during mammalian embryonic development, where errors in gene silencing can result in growth abnormalities. RNA (ribonucleic acid) is a form of genetic material that is now emerging as a key player in gene silencing, however this					

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	process is not well understood. This project will explore how RNA is involved in gene silencing and inform our understanding of this process during development and throughout life. These research findings will contribute new and important knowledge to Australia's rapidly growing RNA biotechnology industry. Gene silencing is also highly relevant in agricultural biotechnology, which relies heavily on genome editing technologies. However these methods are particularly inefficient in the case of silent genes. This research will address this technical limitation through the development of tools to alter the structure of silent genes enabling more efficient editing. These tools will be adopted through partnership with the agriculture industry, resulting in faster and more efficient development of genetically modified crops and livestock animals, increasing yield and drought resilience. This work will therefore benefit several areas of economic importance in Australia, including agriculture, animal and human health, and research.					
DE250101179 Nguyen, Dr Anh T	**G protein-coupled receptor Response Mechanisms to Environmental Pollutants** This project aims to elucidate how plastic pollutants interact with membrane receptors, specifically two critical cellular sensors: adenosine A1 receptors and G protein-coupled estrogen receptors. It integrates molecular biology, analytical pharmacology, computational modelling, and artificial intelligence. The anticipated outcome is a comprehensive insight into ligand-receptor binding, trafficking, signalling and molecular interactions of these plastic pollutants, which have broad implications for public health and environmental policy. This research could potentially lead to the development of safer and more effective strategies for managing and mitigating the impact of environmental pollutants on human health and ecosystems.	79,116.00	159,743.00	161,680.50	81,053.50	481,593.00
	National Interest Test Statement This research venture embarks on a novel exploration of how G protein-coupled receptors (GPCRs), vital for cellular communication, are affected by plastic pollutants, addressing a significant gap in both Australian and global research. By investigating the interactions between these environmental pollutants and GPCRs, our work aims to reveal their impact on public health and ecological health. Findings of this research are expected to guide pollution mitigation strategies and the development of safer plastic materials. The project stands to inform public health policies and preventive measures against pollution-related diseases, offering economic and health benefits for Australians. An enhanced understanding of the effects of plastic pollutants on both human and environmental health will also fortify Australia's position as a leader in biological and ecological research. To maximize the impact of our findings, we plan to share our discoveries through public lectures, open-access publications, and partnerships with educational institutions. We will foster discussions with industry leaders to explore potential commercial applications, ensuring the translation of research into societal benefits. By providing insights that can guide policymakers, industry practices, and community awareness, this project aligns with the national interest, seeking to protect the well-being of citizens and Australia's natural beauty, thereby promoting a healthier, more sustainable future.					
DE250101183 Cary, Dr Brian P	**Leveraging electron microscopy to study receptor structure and function** This project aims to address key knowledge gaps regarding the molecular mechanisms of peptide hormone receptor function, using the parathyroid hormone receptor as a model system. This project expects to use an interdisciplinary approach, focused on cutting-edge microscopy techniques, to generate new insights. Expected outcomes of this project include a three-dimensional, step-by-step view of the receptor's activation and deactivation process at high resolution, as well as optimised sample preparation methods for microscopy. This should provide significant benefits by greatly enhancing our understanding of this physiologically important receptor and potentially improving numerous future structural studies on similar receptors.	81,425.50	162,801.00	162,801.00	81,425.50	488,453.00
	National Interest Test Statement Cells communicate with one another using molecular machines called receptors. These proteins, mainly located on the cell surface, play critical roles in human biology. A holy grail for understanding receptors is to capture the three-dimensional structures of these receptors at every step of their activation and deactivation cycle. Using advanced electron microscopy, protein engineering, and sample preparation techniques, this project strives to image and reconstruct these key steps for the parathyroid hormone receptor, a protein that helps maintain blood homeostasis. The insights and tools gained from this research will be widely applicable to other receptors of physiological importance. Results will be disseminated to the public through engaging media (e.g. images and animations) and will be made available to industrial collaborators that have invested in Australian microcopy expertise. Ultimately, the findings from the research will provide economic benefits to the Australian community by supporting structure-guided biotechnology and future drug development efforts.					
DE250101210 Leung, Dr Pok Man	**Spatiotemporal control of microbial and biogeochemical activity in drylands** This project seeks to reveal the fine-scale temporal and spatial controls of dryland microbial communities and their activities. Through diel sampling, depth profiling, and microclimate monitoring, paired with species-resolved multi-omic analysis and biogeochemical measurements, this project expects to resolve how dryland microbes adapt to these challenging dynamic ecosystems, how they regulate nutrient cycling and atmospheric gas composition, and how their activities support ecosystem productivity. Expected benefits include basic knowledge on dryland ecosystem	81,430.50	162,879.00	162,897.00	81,448.50	488,655.00

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	functioning, a framework to predict ecosystem responses to environmental change, and insights for management practice to stimulate favourable soil microbial activity for agriculture. **National Interest Test Statement** Soil is an essential component of the Earth's ecosystems, and microorganisms that live in the soil play a central role, taking in carbon and nutrients and releasing them back into the environment. This process is known as “cycling”, and is critical for the biodiversity of our natural environments, as well as for productivity in agriculture. However, the activity patterns of these microbes and their role in elemental cycling in “dryland” ecosystems, which are characterised by a lack of water, are not well understood. This project will address this knowledge gap through an in-depth study on cycling by soil microbes across time and space within Australia’s dryland ecosystem – which makes up three-quarters of Australia’s total landmass. This new knowledge will directly contribute to Australia’s National Soil Strategy, which will enable accurate forecasting of the health of our soil ecosystems based on global environmental changes, and predictions of the role of Australia’s drylands in modulating climate. We will partner with Government and land owners to inform policy and land management strategies that will simultaneously protect and increase productivity of vulnerable drylands, which are crucial for Australia’s $60 billion agricultural industry. Considering the economic importance of Australia’s soil ecosystems, and their role in the health of our environment and population, the benefits of this study are likely to be far-reaching.					
DE250101220 Lymbery, Dr Rowan A	**Unravelling evolutionary effects of mitochondria on sperm and male fitness** This project aims to uncover the mechanisms by which mitochondrial mutations affect sperm traits, how such mutations alter sexual selection and reproductive success, and whether they influence offspring viability through paternal effects. Theory predicts that mitochondrial genes should affect sperm production and function, but this has never been comprehensively tested. Leveraging cutting-edge methods, this project expects to generate new knowledge in mitochondrial evolution, sexual selection, and reproduction. Expected outcomes and benefits include fundamental discoveries with broad implications across fields of evolution, ecology and male reproductive biology, and development of mutually beneficial international collaborations. **National Interest Test Statement** This project will apply innovative approaches in evolutionary genetics to solve questions that have remained intractable. Specifically, the project will test whether the variation existing between males in the genes of their mitochondria (the cells’ batteries) impacts their fertility and health of their offspring. Through its international collaborations, the project will bring cutting-edge genetic approaches to Australia, resulting in breakthrough discoveries that position the nation at the forefront of research innovation in evolution and genetics. The project’s outcomes are expected to inspire new research in reproductive biology, and may facilitate the discovery of new genetic factors causing infertility in humans. The discovery of these factors could ultimately lead to new targets for treatment, offsetting recent drastic declines in fertility among men, and delivering economic and social impacts for Australia. The translation pathway of this project will prioritise strategic engagement across disciplines, disseminating fundamental outcomes of this evolutionary research at national conferences in mitochondrial and reproductive medicine to audiences of biomedical researchers, industry and clinical stakeholders. At Monash, I will build a working group connecting mitochondrial researchers spanning evolutionary and biomedical fields, via workshops that may facilitate the translation of the research outcomes into practical applications.	79,763.50	157,299.50	155,011.50	77,475.50	469,550.00
DE250101252 WU, Dr YUXIANG	**Advancing Australian Green Steel through Redox Transformations** The project aims to adopt a microstructure-focused approach in exploring the transformation kinetics of hydrogen-based iron oxide reduction and the subsequent corrosion of the reduced iron. These coupled redox phase transformations are central to the efficient production of green steel and its continental transport, tackling the challenges in advancing Australia's leadership in integrating green steel and green hydrogen technology. This work will offer a timely technology guideline tailored for the Australian green steel industry, based on the new knowledge platform for these redox transformations. The effort aims to enhance R&D autonomy in Australia, optimising green steel technologies to support the national goal for net-zero emissions. **National Interest Test Statement** Australian manufacturing currently faces a unique opportunity to flourish while adhering to zero-emission commitments. This project explores this opportunity by integrating green steel and green hydrogen industries to establish a novel approach to green exports. Specifically, it focuses on the scientific principles of efficiently producing hydrogen-reduced iron and maintaining its economic value during intercontinental transport. The research addresses technical challenges unique to Australia's role as a global resource exporter, particularly in the value-added minerals and green hydrogen sectors. By developing solutions to these coupled growing sectors, the project aims to enhance both the technical and economic aspects of Australia's emerging green steel industry. This research is crucial for ensuring Australia secures a prominent position in the global green manufacturing value chain. It will enable Australia to adapt to the evolving landscape of sustainable manufacturing by providing carbon-free iron, thereby enhancing its strong export economy with greater value addition, compared to merely exporting iron ore. The project will yield a tailored science-based technology guideline for the Australian green steel industry, developed in collaboration with industry collaborators in mining and renewable energy. This guideline, freely available to the public, contributes to transforming Australia's $100+ billion iron ore export sector into a zero-emission industry.	80,871.50	159,613.00	159,702.50	80,961.00	481,148.00

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DE250101300	**Ethics, evidence, and expert disagreement in public health emergencies**	76,347.50	157,391.50	158,202.00	77,158.00	469,099.00
Jamrozik, Dr Euzebiusz	Public health responses to pandemics have major consequences beyond the diseases themselves. Ethical responses must balance the benefits of controlling epidemics with causing social and economic harms to society. This project aims to understand how expert disagreement over evidence contributes to contentious emergency public health responses. Expected outcomes include new evidence-based methods for ethical evaluation of public health responses that may reduce harms, along with guidance on how public health ethics frameworks should be used when experts disagree. The project hopes to provide social and economic benefits to Australia by helping health policy makers ethically balance the benefits and harms of pandemic responses.					
	National Interest Test Statement					
	Infectious disease emergencies are a major threat to Australia's health, but public health responses also result in additional health, social, and economic costs. The costs of the COVID19 response include increased death rates due to diabetes, dementia, heart disease, and cancer, as well as a mental health crisis. The economic costs are over $400 billion, and are especially felt by low-income families. Differences in public health responses across states and countries highlighted the lack of evidence on how ethically informed public health policies can be made and changed when evidence is uncertain and experts disagree. This project aims to address this gap. This project could provide social, economic, and health benefits to Australia by developing better tools to inform ethical public health responses to epidemics where experts disagree, which might help avoid the unintended social and economic costs currently being experienced by Australians and other countries. The findings and tools resulting from the project will be shared with key stakeholders including public health experts, government health departments and policy makers, bioethicists and the public through a workshop, meetings, publications and resulting media interviews. An in person and online research engagement workshop will be run at Monash University for key stakeholders to attend, with members of the public able to attend via a live online presentation platform.					
DE250101338	**Human perceptual decision-making: bridging molecules, systems and behaviour**	81,143.50	162,342.00	162,647.00	81,448.50	487,581.00
Biabani, Dr Mana	Decision-making is the process through which sensory information is transformed into appropriate action and is critical to cognitive performance. This project aims to understand the causal neurobiological mechanisms underlying perceptual decision-making using a novel framework which combines non-invasive brain stimulation, neuroimaging, pharmacological and experimental manipulations, and neurally-informed behavioural modelling. Expected outcomes include a critical understanding of the molecular mechanisms underlying both neural activity and decision-making performance in healthy individuals. This research will uncover the ways in which brain dynamics shape an individual's decisions, offering key insights for tailored interventions.					
	National Interest Test Statement					
	How the brain translates sensory information into action, known as perceptual decision-making, remains a major unanswered question in neuroscience. By using a unique combination of experimental characterisation and theoretical computation, this study will provide the first comprehensive causal mapping of the neurobiological mechanisms underlying decision-making in humans. This research will yield a number of important fundamental outcomes, including a greater understanding of 'when' and 'where' in the brain perceptual decisions are formed and how our brain chemistry tunes these decision-making processes. The knowledge gained will have important applied outcomes in helping to understand, and potentially optimize, decision making in for example, healthy aging, a major issue given the rapidly aging population in Australia, and in post-stroke recovery, the economic burden of which is immense (>26 billion AUD p.a.). The brain networks and neurochemical processes identified in this research could guide strategies to enhance cognitive function in these groups. All data and outputs of this project will be publicly available on open-source platforms, promoting accessibility and collaborative progress. The project will use social media and workshops to establish partnerships with industry and policy groups, translating research into practical applications and bridging the gap between academia and real-world implementation.					
DE250101553	**Investigating artificial intelligence risks for the Australian workforce**	76,916.50	158,262.00	162,790.00	81,444.50	479,413.00
Fordyce, Dr Robbie D	The project aims to examine the way that office software is increasingly used to gather data from Australian workers to train the artificial intelligence that may replace them. The project expects to produce new knowledge on the consequences of artificial intelligence for workers and businesses through surveys and interviews of digital workers and businesses. Expected outcomes include a report identifying the risks to workers jobs in sectors most dependent of office software, and recommendations for potential retraining needs for affected workers. Benefits include a better understanding of potential social and economic consequences of artificial intelligence driven job losses.					
	National Interest Test Statement					

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		2024-25	2025-26	2026-27	2027-28	
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
	Artificial intelligence presents a new risk to the employment prospects of the Australian workforce. Office workers are at risk of replacement by artificial intelligence and office software, such as Microsoft Office and Google Docs, that collect data that can be used to train artificial intelligence tools that may replace workers in many sectors in the near future. However, little is known about how workers and businesses that rely upon this software understand the consequences of, and are concerned about, this behaviour and its potential influence on jobs and businesses. The project will address this gap in our knowledge. The project has the potential to benefit Australia both socially and economically. Artificial intelligence will increasingly replace human workers in many sectors of the workforce. By understanding the potential retraining needs of worker in these sectors, the project could benefit Australia by identifying future educational needs and associated economic supports for workers who may be affected by artificial intelligence driven redundancy, and by supporting public and policy discussions about the future workforce. The results and recommendations from the project will be shared with key stakeholders such public policy makers, unions, software providers, NGO's and the public. Key findings of the research will also be shared through press releases and resulting media interviews.					
	Monash University	1,563,392.00	3,141,003.00	3,153,589.00	1,575,978.00	9,433,962.00
RMIT University						
DE250100105	**Prefab rehab: offsite construction for liveable and affordable apartments**	74,776.50	155,386.50	156,559.50	75,949.50	462,672.00
Dorignon, Dr Louise B	This project aims to investigate the implications of a shift to offsite construction for urban apartment housing delivery and consumption using a critical social science approach. This project expects to generate new knowledge in the field of urban geography, housing and built environment research by qualitatively documenting perceptions and attitudes towards housing built offsite. Expected outcomes of this project include a novel theoretical understanding of offsite construction as well as housing policy and construction industry pathways towards greater housing affordability and quality. This should provide significant benefits, such as improving apartments and responding to National Cabinet's ambition to deliver better housing outcomes.					
	National Interest Test Statement					
	Australia needs more quality housing urgently, but the construction industry cannot meet the demand. The project considers the overlooked social, political and institutional barriers to the adoption of prefabricated housing construction in Australia. This project will analyse the relationships between residents' needs and expectations, housing policy, and construction industry practice, to understand the effects that a shift to prefabricated housing construction would have in Australia. The research will enable more apartments to be constructed in factories, which will increase employment opportunities and reduce carbon emissions in the building industry, and increase the quality, affordability and availability of housing. The project will produce criteria to assess the design and liveability of dwellings made offsite. This will support public servants, architects, town planners and the construction industry by minimising the business risks of producing housing in factories. Focus groups with State and Federal government stakeholders, housing regulators and building industry representatives will inform policy recommendations that facilitate the adoption of these construction methods. To increase the general public's understanding and awareness of new models of housing, real-life stories will be published in mainstream media demonstrating the benefits of factory-built housing.					
DE250100115	**Investigating journalist influencers and their young adult audiences**	74,822.00	155,939.50	160,248.00	79,130.50	470,140.00
Hurcombe, Dr Edward F	This project investigates how journalist influencers – professional journalists adopting personal modes of content delivery characteristic of online influencers – are reshaping news to reach and build trust with young adult audiences. It studies journalist influencers in three countries producing news content on TikTok, Instagram, and YouTube. It generates urgently needed empirical knowledge about the character and impact of such novel journalists by systematically investigating their content, practices, and audiences. Outcomes include a comprehensive evaluation of journalist influencers as a youth engagement strategy. Benefits include new knowledge about market gaps and evidence-based contributions to debates on news quality in Australia.					
	National Interest Test Statement					
	Journalists are increasingly adopting the strategies of online influencers to produce and deliver news on TikTok, Instagram, and YouTube to young audiences who are avoiding traditional news brands. This innovative project will investigate how journalists are adopting this novel model of news delivery, what kind of content they produce, who their audiences are, how they engage with them and with what success. The project will generate evidence for the news industry on the gaps in the youth market that journalist influencers can address, as well as investigate the long-term viability of journalist influencer practices and evaluate the journalistic standards of their content. This will benefit the Australian news industry economically by identifying how journalists can reach young people on video-centric platforms who may be avoiding news brands. It will also bring social benefit to the Australian public by identifying ways that the news industry can build trust with young audiences on digital platforms where misinformation spreads easily. Research outcomes will be promoted to the Australian public and to industry and policymakers through regular media commentary, an accessible public-facing industry report, and a multi-stakeholder symposium held at the end of the project					

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DE250100886	**AI-assisted design of halide perovskite optoelectronics and photocatalysts**	81,352.50	160,205.00	160,255.00	81,402.50	483,215.00
Mai, Dr Haoxin	This project aims to address energy and environmental issues by developing efficient, non-toxic and stable halide perovskites by combining machine learning, theoretical calculations and material synthesis. This innovative approach will be more economical, better meet the ever-growing demands of the optoelectronic market than traditional methods with the help of AI models, and lead to new knowledge in materials science. Expected outcomes include industry-ready materials for optoelectronics and AI models for fast material screening. This will provide benefits in the development of next-generation optoelectronics for clean energy and environmental remediation and improve our understanding of structure-property relations in perovskite.					
	National Interest Test Statement					
	The growing demand for energy and its associated environmental concerns, such as air pollution and climate change, are major problems. Halide perovskites show great promise in energy and environmental applications, including solar cells, energy-efficient lighting devices and photocatalysts for converting CO2 into value-added products and degrading pollutants. But many of them are inefficient, costly, unstable or toxic, with conventional development of these materials being time consuming and costly. This project aims to design efficient, non-toxic and stable halide perovskites to address energy and environment issues. A combination of AI techniques, computation and experimentation will be applied to design new-generation halide perovskites with commercial potential. Outcomes of this project (e.g., publications, patents, AI models made freely accessible online and associated media releases) will advance materials science and complement energy transfer technologies (e.g., photocatalysis, photoluminescence, photovoltaic). Industry collaborations, with workshops on AI and material design to foster expertise in material manufacturing, will accelerate commercial functional device development (e.g., photocatalytic clean fuel production reactors, light-emitting diodes, solar cells). This is expected to improve Australia's competitiveness in advanced manufacturing, reduce fossil fuel reliance, lower Australia's carbon-footprint, and benefit energy and environment sectors.					
DE250100961	**Fast Distributed Optimisation and Learning with Applications in Smart Grids**	75,088.50	152,677.00	152,677.00	75,088.50	455,531.00
Xinli, A/Prof Shi	This project aims to develop a breakthrough framework for fast, communication-efficient distributed optimization and learning targeted for efficient decision-making in smart grids. It expects to create novel theories and methodologies for conducting efficient distributed learning in a resource-constrained power grid by using interdisciplinary approaches. The expected outcomes include the advanced theory of large-scale optimization for addressing the increasingly complex decision-making tasks for the future grids of Australia. This should provide the benefit of a distributed learning-based framework for real-time optimal energy management to enhance efficiency, resilience and reliability of smart grid operations against a changing climate.					
	National Interest Test Statement					
	Australia is facing increasing challenges because of climate change and the use of different energy sources. Energy that is dependable, low-cost, and good for the environment is urgently required. New technologies, like better ways to manage energy with numerous renewable resources and various participants, are important for a secure and efficient energy system. This research will develop smart technologies that help better manage energy through data processing, which can save money for people, businesses, and companies that provide energy in a more efficient way. Effective energy decision-making involves using cleaner energy sources can reduce greenhouse gas emissions and allow the power grid to recover quickly from disasters. By using advanced data processing techniques, it enables better demand forecasting and thus encourages the adoption of cleaner and cheaper energy sources during high-demand periods. It also helps make energy affordable for communities and keeps the energy market working well. In addition, these new technologies can also make Australia attractive for investments in clean energy. This can help businesses be more competitive by using energy more efficiently. The research will lead to working with other countries to create new and advanced solutions for managing energy. It will also benefit industry and society broadly through sharing the results with the public on webpages, online or hybrid events like seminars and workshops with people around the world.					
DE250101034	**Modelling soil-cement interaction to design new-generation offshore wells**	81,448.50	161,897.00	159,397.00	78,948.50	481,691.00
Du, Dr Jiapei	This project aims to investigate soil-cement interactions under complex marine conditions and cement chemical environments. This insight will inform the design of new-generation offshore energy extraction wells. This project expects to generate new knowledge in soil and cement science, modelling, and offshore geotechnical engineering using interdisciplinary methods, multiscale experiments and simulations. Expected outcomes are a new set of technologies to enhance offshore well stability and a transformative roadmap to design geotechnical engineering applications for future generations. This should provide significant benefits to Australia by preventing oil and gas leaks and contributing to sustainable development in offshore resources.					
	National Interest Test Statement					

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
	In Australia, three-quarters of the oil and gas resources come from offshore areas. However, offshore energy extraction well failures have led to significant oil and gas leaks, causing economic losses that could exceed $10B AUD per incident. These failures are mainly caused by the challenging marine conditions like low temperature, high salt content in seawater, and instability of marine soft soils. Currently, there is a lack of reliable methods to cement these offshore wells against the harsh marine conditions. This project aims to develop new, more effective cementing materials, design tools and operational standards for constructing offshore energy extraction wells. The knowledge and techniques developed from this project are expected to prevent oil and gas leaks, leading to massive economic savings for Australia. This is particularly significant as oil and gas mining will grow further following the Federal Government's recent assignment of a 46,000 km2 ocean area for oil and gas exploration. This project is expected to make great contributions to national energy security and environmental protection, positioning Australia as a leader in the design of next-generation geotechnical materials and techniques for harsh environments. The findings will be communicated to the Australian resource industry and government bodies through professional organisations, industry conferences, and exhibitions, and will be shared with the public via media outlets.					
DE250101373 Zhao, Dr Shaoyu	**Steel Origami-Enabled Metaconcrete Composite Structures** This project aims to develop a novel integrated design platform to engineer high-performance and multifunctional origami-enabled metaconcrete composite structures with greatly improved ductility and energy absorption capacity. It expects to offer a cost-effective and efficient structural design solution in the next-generation advanced concrete structures with optimal performance. Expected outcomes include an innovative metaconcrete structural design scheme and a robust machine learning-assisted optimisation procedure for various engineering applications against static and impact loading. This will provide significant benefits to building industries by enhancing structural safety while reducing material usage and lowering carbon emissions.	76,938.50	154,577.00	155,277.00	77,638.50	464,431.00
	National Interest Test Statement Concrete structures are of prime importance in infrastructure systems. As an emerging construction material, metaconcrete - a new type of concrete with enhanced dynamic behaviour - has many mechanical and functional advantages over conventional concrete and hence can lead to economical and sustainable constructions. However, metaconcrete in its current form lacks enough performance and design flexibility, limiting its wider acceptance and practical applications. This project will introduce folded steel sheets into concrete to innovatively develop a novel steel origami metaconcrete structure with unprecedented properties. The developed design platform will facilitate innovation in advanced high-performance and multifunctional concrete structures with broad engineering applications in civil, transportation, and marine fields. This will also bring Australia substantial economic, social, and environmental benefits by providing advanced materials and structures with improved performance, safety, and sustainability. The proposed project will reduce materials usage, increase structural efficiency, and lower carbon emissions, directly aligned with Australia's Net Zero 2050 targets. I will promote my research widely through public media such as LinkedIn and YouTube. The project's success will reinforce Australia as a global leader in the metaconcrete construction industry.					
DE250101462 Zhao, Dr Yong	**Energy and carbon-efficient CO2 electrochemical reduction in strong acids** This project aims to develop efficient CO2 electroreduction to multi-carbon products in strong acids, coupled with high CO2 utilisation. The key concept is to explore covalent organic framework functionalised catalysts to promote multi-carbon formation in acidic local condition. This project expects to generate new knowledge in catalyst microenvironment control. Expected outcomes include a new class of composite electrocatalysts, an in-depth understanding of acidic CO2 reduction mechanism, and a demonstration of practically viable electrolyser prototypes. This should provide significant benefits such as advancing Australia's CO2 capture and utilisation and accelerating the transformation of its energy industry to achieve net zero emission.	81,388.50	162,627.00	162,477.00	81,238.50	487,731.00
	National Interest Test Statement The global transition to sustainable development and carbon neutralisation has created significant challenges for Australia. Electrochemical conversion of CO2 offers an opportunity to leverage Australia's rich renewable energy capacity and resources to convert waste CO2 into value-added multicarbon products such as ethylene and ethanol. Commonly derived from oil extraction, these products are widely used chemicals and raw materials in industry, e.g., ethylene is the precursor of polyethylene, a plastic used in everyday products from packaging to pharmaceuticals. However, the current CO2 conversion technology requires too much energy and wastes too much CO2 input when making these products. The proposed method differs from all previous CO2 conversion methods as it uses an acidic – not alkaline or neutral – reactive chemical, overcoming the energy and CO2 utilisation challenges. The process can potentially be scaled up and easily integrated into industrially existing water splitting electrolysers, significantly reducing the operation and facility costs in future commercialisation. The proposed technology is promising to create fully circular carbon economies, significantly reducing the reliance of oil extraction to create useful products like ethylene. It will not only cut down carbon emissions but also store Australia's rich renewable electricity within useful fuels, supporting Australia's sustainable development. These findings will be disseminated broadly via social media.					
	RMIT University	545,815.00	1,103,309.00	1,106,890.50	549,396.50	3,305,411.00

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
Swinburne University of Technology						
DE250100508	**Discovering the origins of cosmic radio explosions**	77,888.50	155,777.00	157,777.00	79,888.50	471,331.00
Lower, Dr Marcus E	Fast radio bursts are intense bursts of radio waves that can be detected from half-way across the Universe. The vast distances these bursts travel makes detailed studies of their exact origins extremely difficult. This problem will be overcome through studying Galactic analogues: young, highly magnetised neutron stars within our own Milky Way that display similar like behaviour. Expected outcomes include discovering the origins of fast radio bursts and how they are affected by their local environments. This project will secure Australia's leading position in radio astronomy and strengthen international collaborations, essential for maximising the return on investment in the under-construction Square Kilometre Array scientific mega-project.					
	National Interest Test Statement					
	Fast radio bursts are explosions of radio light that originate from distant galaxies. Australian scientists have been using to these events to weigh the matter content of our Universe and determine how fast it is expanding over cosmic time, however our understanding of where and how they originate is limited. This project will resolve this shortcoming by leveraging innovative data analysis techniques and recent upgrades to world-leading radio astronomy observatories, including Australia's iconic Parkes Murriyang radio telescope. The program will uncover how and where these explosions are generated by analysing suspiciously similar radio signals emitted by city-sized ultra-magnetised stars that reside in our own Galaxy, thereby enhancing Australia's reputation as a global leader in radio astronomy research. These exciting discoveries will be realised through international partnerships and shared with the public through accessible media releases, increasing the scientific literacy of Australians and inspiring young minds to follow careers in science and technology. This project will also train the next generation of researchers in computer programming, data analysis techniques and complex problem solving, skills which are vital to both academia and many industries such as climate science, engineering, and finance.					
DE250100933	**Enhancing Australian Dark Matter Searches with Quantum Technology**	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00
McAllister, Dr Benjamin T	The nature of dark matter is one of the biggest mysteries in the Universe and detecting it would represent an enormous paradigm shift. This research aims to enhance Australia's efforts in dark matter detection by designing new experimental searches for dark matter and developing quantum technologies to improve existing experiments. Future quantum technologies are expected to revolutionise computing, sensing, and other fields. This DECRA will make strides in both areas: extending dark matter detectors into new regimes, and developing new technologies with applications beyond fundamental physics. The potential impacts of dark matter discovery are staggering, and difficult to overstate, and this DECRA will bring it closer to reality.					
	National Interest Test Statement					
	Dark matter makes up over 80% of the matter in the Universe, yet its nature remains a mystery. As a result, the nature of dark matter is one of the greatest questions in modern science. This project will extend Australian dark matter searches into new regimes. It will design experiments to detect dark matter in mass ranges that are not currently well probed and develop quantum technologies both to enable these new experiments and to enhance existing and planned experiments. In the shorter term, Swinburne's Innovation Studio will evaluate the newly developed technologies for commercialisation potential, impacting Australia's emerging quantum technology industry, and addressing a National Science and Research Priority - advanced manufacturing. Australia has a clear, stated quantum research priority in the National Quantum Strategy released in 2023, and this project will contribute to it. In the longer term, we know that dark matter makes up 5/6 of the matter in the Universe - the benefits of understanding it are difficult to state precisely, but likely paradigm shifting for humanity. Project benefits will be realised through open access research outputs, through educating and training future quantum technology leaders, and through seeking translation of technologies both to industry and to other areas of science.					
	Swinburne University of Technology	159,337.00	318,674.00	320,674.00	161,337.00	960,022.00
The University of Melbourne						
DE250100168	**Housing and neighbourhood determinants of inadequate sleep**	80,714.50	161,897.00	162,458.00	81,275.50	486,345.00
Mason, Dr Kate E	This project aims to address a gap in scientific knowledge about the ways housing and neighbourhood factors contribute to inadequate sleep–a problem affecting ~40% of Australians, causing significant economic burden through lost productivity and wellbeing. This interdisciplinary project will develop rich conceptual models of the determinants of sleep, and leverage existing data to generate new evidence to advance our understanding of how residential contexts affect sleep and					

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
	inequalities in sleep. Expected outcomes include a new conceptual model, and enhanced capacity and networks to drive future research in this emerging field. The evidence produced should inform practical change to reduce societal and individual costs of inadequate sleep. **National Interest Test Statement** Almost 40% of Australians don't get enough sleep. Inadequate sleep impairs learning and decision making, and increases the risk of accidents and poor health, costing our economy >$60 billion annually in lost productivity and wellbeing. The importance of sleep is starting to be recognised, but so far most research has focussed on biomedical and lifestyle causes and consequences of poor sleep, neglecting the ways our homes and neighbourhoods can influence our sleep, e.g. via noise, heat, and pressures of housing insecurity and long commutes. This project will conceptualise and generate new knowledge about how the places Australians live may contribute to inadequate sleep, and to social inequities in sleep problems. Using advanced statistical methods to analyse existing high-quality data, the project will improve our understanding of the role of our home and neighbourhood contexts for sleep. It will build a new evidence base to be shared with policymakers, urban planners and architects in a workshop to identify practical changes to support better sleep. In doing so, the project stands to benefit Australian society by helping reduce negative impacts of inadequate sleep on our economy and collective wellbeing. Furthermore, with many likely contextual drivers of sleep (e.g. traffic noise, hot housing) also linked to other individual, social and environmental outcomes, this project may help address other important societal challenges, such as housing disadvantage and climate change.					
DE250100185 Vincent, Dr Caitlin C	**Navigating Inequality: Pathways for Conductors and Directors in Opera** This project aims to use opera as a lens to examine gender inequality in freelance work contexts. Using an innovative, mixed-methods approach that frames the global opera industry as an ecological system, the project expects to generate new knowledge about the factors that support career advancement for conductors and stage directors and provide an evidence-based framework to evaluate equity initiatives. Outcomes include enhanced capacity to increase diversity in opera and other sectors of the creative industries that rely on freelance work. Expected benefits include more equitable and sustainable work structures for freelance workers in the creative industries. **National Interest Test Statement** Gender inequality is a persistent issue in the creative industries, particularly in fields like opera that rely on freelance labour. In particular, women are poorly represented as both conductors and stage directors at the largest opera companies in Australia and the United States. In the wake of the #MeToo movement, sectors across the creative industries have developed initiatives aimed at promoting women. However, these efforts are not always evidence-based in design, limiting their impact. To address this gap, this project will use a novel methodology to examine the career pathways of conductors and directors in opera, with the aim of identifying the key factors that support or hinder their professional advancement. This analysis will drive new understandings of the complexities of freelance careers and enable practical ways to address gender inequality. Alongside scholarly outputs including journal articles and an edited book, a major outcome of this research will be a report, produced in consultation with Creative Australia, that outlines strategies to improve professional outcomes for women and other marginalised cohorts. The economic and cultural benefits of this project include increasing equity, opportunity, and access in a culturally-prestigious industry that receives significant government funding despite its still largely exclusionary practices.	76,542.00	143,369.50	143,104.50	76,277.00	439,293.00
DE250100194 Millwood, Dr Peter L	**Island of Democracy: Transnational Currents & the Democratisation of Taiwan** This project examines Taiwan's transformation from one of the world's most authoritarian regimes to the most vibrant democracy in East Asia today. Drawing on new sources from archives within and beyond Taiwan, the project will use an innovative transnational methodology to investigate the extent to which Taiwan's democratisation was not only the result of a struggle in Taiwan but also of a global contest for the island's future, involving Taiwanese and non-Taiwanese actors and taking place across Asia, North America, Europe, and Australia. Understanding the global context of how Taiwan broke free of authoritarianism will shed light on democratic resilience in the Asia–Pacific today and on alternative political futures in the Chinese world. **National Interest Test Statement** Today, Taiwan is one of the most recent and vibrant democracies in Asia, with these political values making the island one of Australia's closest regional partners. Taiwan's four decades of repressive martial law forced many democracy activists abroad, where they collaborated with non-Taiwanese supporters, such as politicians and civil society organisations like Amnesty International, to connect the cause of Taiwanese democratisation to a rising global movement for human rights. This project will deepen our understanding of Taiwan's remarkable political transition away from authoritarianism by investigating the role of these actors outside of Taiwan in the island's democratisation. By examining governmental and non-governmental archival records in Taiwan and across the world, the project will produce new understanding of the global origins of Taiwan's democratisation and the role of Australia and other international actors in the development of democracy in our region. Its findings will be shared with the Australian public, government officials, and civil society through non-academic and media publications and a workshop in Canberra. The project will thus inform more effective government policy and civil society resistance to threats from authoritarian states such as China and support work to protect and promote democracy in Australia, Taiwan, and across the Asia Pacific.	81,393.50	152,632.00	152,641.00	81,402.50	468,069.00

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
DE250100255	**Starship transposons as a mediator of eukaryotic horizontal gene transfer**	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00
Urquhart, Dr Andrew S	The project aims to understand the basis for how a recently discovered group of transposable elements are able to move within and between genomes. The significance of the planned work is to close a major gap in understanding how evolution occurs, whereby instead of the standard transmission down generations species acquire new genes from other species. The expectation is to define the genetic elements that control this in a large lineage of fungi that impact human endeavours ranging from food processing to plant disease. Because these elements now appear so prevalent in fungi, and are known to carry important genes including those for plant disease, the knowledge gained will help to predict disease outbreaks and protect Australian crops.					
	National Interest Test Statement					
	Pathogenic fungi cause a large variety of plant diseases such as mildew and root rots and are a major cause for crop losses in Australia, costing billions of dollars to the economy annually. New fungal diseases can emerge, for example when a fungus evolves to infect a different type of plant. We currently do not have a clear understanding of how fungi can evolve rapidly to infect new plants. This project investigates a new type of genetic element, Starships, which are suspected to be able to move between different fungal species. Starships carry genes that are beneficial to the fungi they are found in, but detrimental to humans. If Starships are moving such genes between species this would be the missing key to understanding rapid evolution in fungi. Furthermore, understanding if and how Starships move between species will allow us to predict with greater accuracy when new fungal diseases are likely to emerge and in turn develop possible strategies to prevent or rapidly control new fungal diseases, ultimately protecting Australia's food production. Collaborations with plant pathologists and the agricultural industry will ensure that research findings are implemented and explored. In the long-term this research will help to generate management strategies for pathogenic fungus control in Australia, benefitting Australia environmentally, economically and commercially.					
DE250100281	**Terrestrial ecosystem resilience to atmospheres enriched in carbon dioxide**	79,213.50	159,362.00	159,324.50	79,176.00	477,076.00
Korasidis, Dr Vera A	This project aims to unlock a hidden record of our planet's resilience to high carbon dioxide levels. Through analysing fossil pollen and charcoal preserved in sedimentary rocks, this project aims to generate new knowledge of the potential impact of climate change on forests, as well as the controls on fire frequency and intensity under greenhouse conditions. Expected outcomes include new methods for interpreting our planet's environmental history, with improved understanding of the environmental conditions that control extinction versus adaptation in plants. This will provide significant benefits to our society and industry such as informing current vegetation adaptation efforts and improving model forecasts for future climate change.					
	National Interest Test Statement					
	One of the greatest challenges facing Australia is climate change and the effect that increases in atmospheric carbon dioxide (CO_2) will have on the natural world. The study of past climates, including vegetation and fire, is essential to understand the potential impacts of rapid climate change for Australia. This project seeks to improve our understanding of past plant-life, as well as fire regimes, during past periods characterised by high CO_2 levels. This research will provide environmental and economic benefits for Australia by informing our current efforts to best adapt to climate change. This includes determining the level of CO_2 that results in increased fire frequency, improving our ability to predict and manage bushfires, which will have major social benefits for those living in high-risk regions. The project outcomes will be promoted via social media, traditional media platforms including the ABC, Pursuit and The Conversation and through public engagement and outreach events, including citizen science projects, to target broader audiences.					
DE250100344	**Enhancing Causal Inference from Large-Scale Surveys using Neural Networks**	76,064.50	152,925.00	154,181.00	77,320.50	460,491.00
Huang, Dr Wei	This project aims to develop a novel deep neural network causal framework for data from large-scale surveys. Existing causal methods are limited to small-scale data or restrictive models and cannot deal with measurement errors and functional data like signals, images, and 3-D scans prevalent in modern surveys. The project expects to establish theoretically justified and robust statistical tools to provide a complete view of causal effects from these challenging settings. Anticipated outcomes include new practical statistical methods and software that help scientists identify the causes of interesting phenomena like public health threats. This should benefit applications in public health, social science studies and government policy arenas.					
	National Interest Test Statement					
	This project will develop new statistical tools for analysing cause and effect within complex real-world data, making it much easier to infer causal connections. The resulting new knowledge of causal inferences will benefit					

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
	studies in many fields, such as public health, where it will help determine the possible causes of health threats. With the potential capability to identify these causes and their effects on public health issues, the project aligns with Australia's national research priorities for 1) improved prediction, identification, tracking, prevention and management of emerging local and regional health threats; 2) better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure. The newly developed methods will also enable social scientists to understand how different policies or environments potentially affect us, providing social and economic benefits for Australia. These innovative techniques will also lead to commercial and economic benefits for Australian companies in the major markets for enhanced digital health systems and internet recommendation systems. Collaborations and outreach efforts aimed at sharing project results with industry bodies, policymakers, and public health organisations will ensure optimal leverage and utilisation of the research findings beyond the project's scope.					
DE250100384 Pimentel Seguin, Dr Caio	**Modelling connectome communication using targeted neural perturbations** Electrical pulses travel across the brain via a vast network of nerve fibres, known as the connectome. This project aims to investigate the problem of how signals are transmitted via the connectome to establish communication between brain areas. The project intends to use the mathematics of networks in combination with data from neural stimulations to create algorithms capable of predicting pulse propagation in nervous systems. This is expected to reveal fundamental principles of connectome communication that will provide insight into how the brain's physical wiring shapes its function. The knowledge generated in this project is anticipated to potentiate technological advances in brain stimulation and brain-inspired artificial intelligence.	78,838.50	157,198.00	156,719.00	78,359.50	471,115.00
	National Interest Test Statement Electrical pulses travel across the human brain through a vast network of nerve fibres. This network, called the connectome, is the physical cabling that allows brain areas to communicate. This communication is crucial to all aspects of the brain's functioning, including how we experience the world and make decisions. However, we currently do not understand how electrical signals are communicated through the connectome's maze of nerve fibres. This knowledge gap poses roadblocks to our understanding of how brain regions work together to process information about the world. In this project, we aim to address this problem by developing computer models capable of simulating the exchange of signals through the connectome. We will use mathematics of networks in combination with brain stimulation experiments to create algorithms capable of predicting how an electrical pulse travels through the brain. Through this computational platform, we aim to reveal fundamental principles of brain communication that will further our understanding of how the connectome's wiring shapes everyday brain function. We anticipate that knowledge generated in this project will potentiate technological advancements in the fields of brain-inspired artificial intelligence and neural stimulation protocols, resulting in economic and commercial benefits to Australia. We will share our discoveries to the public via press releases, popular science articles, and social media.					
DE250100403 Li, Asst Prof Mogeng	**Understanding the transport of microplastics in complex turbulent flows** This project aims address the pressing issue of microplastic pollution in aquatic environments. The small size of microplastics makes them susceptible to complex fluid motions, resulting in distinctive transport pathways compared to larger plastic debris. Despite their widespread presence, predicting the occurrence and concentration of microplastics remains challenging. The project expects to generate a comprehensive dataset on microplastic transport behaviour using controlled laboratory experiments, with the ultimate goal of predicting their distribution in ocean and rivers. The anticipated benefit includes pollution control and ecosystem protection, aligning with Australia's priorities related to soil, water, and environmental change.	81,448.50	162,897.00	162,855.00	81,406.50	488,607.00
	National Interest Test Statement Plastic pollution is a global challenge because of its long life and the huge amount manufactured for single use. Plastics do not decompose, but break down into harmful microplastics. Microplastics risk the health of aquatic ecosystems and their dependent communities throughout our oceans and rivers. Microplastics are transported by the forces of waves and currents and have been detected far from their terrestrial pollution sources. Understanding their movement is important to prevent further global pollution. Yet their distribution remains highly unpredictable due to gaps in our models, which fail to account for non-spherical particles and their interactions with complex turbulent flow patterns. This project will measure the factors that dictate particle transportation rates under controlled laboratory experiments and will use this data to improve existing models. These models will be incorporated into global-scale numerical simulations of oceans, providing invaluable insights to guide policymaking and formulate effective control strategies. Findings will be shared widely through publications and seminars to government and industry. It will benefit Australia's environment and society by raising awareness of microplastic pollution and promoting reduced use of plastic. Economic benefits include safeguarding ocean farming by avoiding potentially harmful microplastic hotspots, reducing cleanup costs, and preventing damage to coastal tourism through reduced plastic pollution.					
DE250100454 Giansiracusa, Dr Marcus J	**Turbocharging Ytterbium Single-Molecule Magnets** Ytterbium, a rare earth ion with rich deposits in Australia, has theoretical potential as a single-molecule magnet (SMM) that has not yet been demonstrated in practice. This project aims to build from preliminary insight to overcome this barrier and prepare the first ytterbium SMMs. The study of	79,388.50	155,027.00	152,277.00	76,638.50	463,331.00

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	novel materials is crucial to make SMMs industrially viable in energy efficient data-storage or quantum computing applications. The outcome of preparing ytterbium SMMs will open a previously blocked avenue, expanding the scope of current research, providing new design criteria and accelerating SMMs towards real world applications. This research seeks new green applications and economic opportunities for Australian critical minerals. **National Interest Test Statement** New materials based on molecular magnets should soon have applications in memory storage devices, computers and quantum computers, but there are still obstacles to developing these materials at industrial scale. This project examines a selection of rare earth elements, used in generating molecular magnets, to identify factors that are holding these materials back from real world applications. Rare earth metals are especially important, given that Australia has around 5% of the world's supply. By developing new applications for these critical Australian commodities, this project can provide the concepts that lead to additional commercial and economic benefits for Australia's rare earth mining and advanced materials industries. This work could also lead to industrial applications beyond the field of chemistry, such as device fabrication and prototyping next generation devices, with further commercial benefits. Research outcomes will be published to build a reputation for the Melbourne Magnetometry Laboratory; generating global collaborations and creating ties with Australian industry, which will enable future commercial translation.					
DE250100557 Dunleavy, Dr Jessica E	**Building microtubule complexity: the exotic tubulins in sperm production** All eukaryotic cells possess a dynamic 'skeleton' of microtubules. While the basic tubulin subunits of microtubules are well defined, how they are organised into complex and functional scaffolds remains an ongoing question. Emerging data suggests that in many eukaryotic species additional tubulin subtypes (the exotic tubulins) unpin this complexity. This project aims to define the mechanisms of the exotic tubulins, TUBD1 and TUBE1, and define how they direct the building and regulation of complex microtubule structures. Insights will be generated using sperm production as a model system and will thus inform the mechanisms by which fertile sperm are built, in addition to being relevant to cell biology across diverse eukaryotic species. **National Interest Test Statement** Cells provide structure and function for all living things. All cells possess a dynamic 'skeleton' of microtubules, which underpins the remarkable diversity in cell structure and function seen across animals, plants, fungi and many other species. While the basic tubulin building blocks of microtubules are defined, how these simple rod-like structures are assembled into complex scaffolds remains poorly understood. Emerging data suggests that in many living things, additional 'exotic' tubulin subtypes may underpin this complexity, but the structure and mechanisms of these tubulins remains a mystery. This project aims to define how these exotic tubulins direct the building and regulation of microtubule structures in sperm production. This research will benefit Australia through knowledge generation, including insights relevant to male fertility in agriculture. It will inform the understanding of cell function across diverse species. With time this may inform selection of high fertility stud animals in agriculture, in addition to biotechnology protocols and drug development, which will have economical and commercial benefits to Australia. Microtubule biology has current diverse applications including herbicides, fungicides and cancer therapies and these opportunities will be explored through partnerships with agriculture and biotechnology industries. Research impact will be accelerated across the reproductive and cell biology sciences through publications and conferences.	81,448.50	162,897.00	162,897.00	81,448.50	488,691.00
DE250100677 Wick, Dr Ryan R	**High-throughput bacterial genome assemblies with perfect accuracy** This project aims to discover and develop new algorithms for reconstructing bacterial genomes using DNA sequencing data. Existing techniques are either error-prone or labour-intensive, so it is not currently possible to produce large numbers of error-free bacterial genome sequences, and this impairs progress in all scientific domains which involve bacteria. This project will address this need by creating new computational methods for reliable and efficient bacterial genomics. The anticipated benefits include advancements in basic biology, agriculture, food production, microbiome research, antibiotic resistance, drug discovery and more. **National Interest Test Statement** A genome is the complete set of genetic material within an organism, and the genome's information is stored on molecules of DNA. DNA sequencers are not able to produce entire genome sequences. Rather, they only produce small fragments of genomes, and errors are common. It is therefore necessary to reconstruct genomes from these fragments, a process known as assembly. Since countless scientific investigations rely on genome sequences, assembly is a critical step. Unfortunately, current assembly methods are imperfect, leading to errors in sequences which can in turn impair the science. This project will develop new computational algorithms and genomics techniques allowing the creation of error-free bacterial genome sequences. This will lead to advancements in all areas that involve bacteria. This includes biotechnology, where bacteria can be used for the production of chemicals, fuels or plastics. It will support environmental remediation, where bacteria can degrade pollution. A clearer understanding of bacterial genomes will enhance public health, especially tracking infectious diseases and uncovering mechanisms behind antibiotic resistance. It will also aid the agriculture and food industries through better understanding of soil and fermentation processes. To ensure research outcomes reach	65,178.50	129,357.00	128,357.00	64,178.50	387,071.00

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	beyond academia, all developments will be made publicly available as open-source code, and blog posts and video tutorials will be made for the benefit of Australian government and industry.					
DE250100891 Ball, Dr Sarah R	**Behind the Screens: Interrogating Digital Service Design and Delivery** This project aims to investigate how policy makers in Australia understand digital service delivery, and how this understanding shapes the design and implementation of ethical and effective digital services. Exploring this meaning-making process will allow this project to address critical gaps in policy development in digital service delivery. Three case studies of federal government digital services will be used to provide a deeper understanding of how policy makers balance the trade-offs inherent in designing and implementing high-quality and appropriate digital services. This will provide significant benefits, building Australia's capacity for future digital delivery and generating new knowledge on policy translation more broadly. **National Interest Test Statement** The Federal Digital Government Strategy 2023 states that digital technology will play a major role in shaping how the public will engage with government in the future. However, recent examples in Australia, such as the implementation of digital employment services and the use of My Health Record, demonstrate how the trade-offs between efficiency, effectiveness, ethics and equity can be challenging to balance in practice. Using document analysis, interviews and case studies, this project aims to interrogate how the policy makers responsible for the design of digital services understand the opportunities and limitations of these digital tools and how these interpretations determine which elements are adopted, which are adapted, and how decisions are made about how to balance the benefits and risks. This knowledge will be used to equip policy makers in the public sector to better understand these limitations and facilitate the design and implementation of more effective and equitable digital services. This will be achieved through the development and delivery of policy reports and training, codesigned with the public sector and facilitated through the Australian Public Service Commission and the Australia and New Zealand School of Government. This knowledge and training will equip the public sector to design more effective and equitable digital services, and in doing so contribute to improved services and reduced risks of harm for the public.	80,550.00	160,470.50	161,057.00	81,136.50	483,214.00
DE250100969 Pan, Dr Siqi	**Matching by Characteristics: Simplification for Efficiency and Fairness** This project aims to explore matching by characteristics as an innovative approach to simplifying preference formation and expression in real-life matching markets. It expects to generate new knowledge on practical market design through lab and field testing of novel matching algorithms and procedures. The expected outcomes include an easy-to-implement matching framework and prototypes of tools applicable to a broad range of environments including refugee resettlement, school choice, employment, and public housing allocation. This should yield significant benefits by improving fairness and efficiency, reducing barriers to information for disadvantaged communities, and offering practical solutions for policymakers in Australia and beyond. **National Interest Test Statement** Fair, efficient allocation is key to achieve equitable outcomes in refugee resettlement, school choice, employment and public housing allocation. Matching theory looks at how goods and services are allocated in markets where preferences matter over price and provides sound algorithms for making rational matches. Yet the theory falls short as it relies on participants (eg school leavers choosing a university) to submit a perfectly ranked list of preferences. This is a costly, cognitively demanding process that can be left incomplete, deeming the algorithm ineffective and risking further inequality. Disadvantaged groups are most affected, as they often face additional challenges acquiring information. This project aims to solve this implementation issue by testing a novel framework based on desirable characteristics over ranking. Through field and lab experiments, we will investigate its efficacy in improving efficiency and equity. Insights will advance the literature and provide significant economic and social benefits by informing policy in Australia and abroad. The tools developed in the project can be adapted to enhance individuals' wellbeing and welfare; save organisations time and money; and help governments address key challenges from the housing crisis to employment disparity. Capacity-building workshops with policymakers, publishing articles in media like The Conversation, and using Twitter for community discussion will ensure framework uptake.	81,448.50	162,897.00	162,702.00	81,253.50	488,301.00
DE250101214 Silcocks, Dr Matthew	**Admixture, Adaptation and Immunity in East Asian Genomes** This project aims to explore how the genomes of human populations in East Asia and Oceania have adapted to fight the pathogens they encountered. We know that pathogens have been one of the strongest threats to survival throughout human history, but we don't fully understand what parts of our genetic sequence are important for fighting them. Using newly published data and techniques, we will screen the genome for important immunity genes, and gain insight into the demographic history of the populations ancestral to Southeast Asia, Indonesia and Australia. This project may eventually contribute to vaccines and therapies for important infectious diseases.	71,388.50	150,252.00	157,017.00	78,153.50	456,811.00

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	National Interest Test Statement This project will investigate how the bacteria and viruses of Southeast Asia and the tropical regions adjacent to Australia have shaped the genetic makeup of human populations throughout history. Recent studies have addressed this question in populations from Europe and Africa, but a gap exists in our understanding of East Asian populations, as this genetic information was previously unavailable. Using newly published genetic data and computer algorithms, we will screen for parts of the human DNA sequence displaying traces of the conflict between us and our pathogen foes. Doing so will allow us to pinpoint the pieces which are important for fighting infection. This research will contribute to our understanding of the demographic history of the groups Indigenous to New Guinea and Island Southeast Asia, which share an ancestral connection with Indigenous Australians. It will also bring us new knowledge of the evolution of the human immune system and how it fights important pathogens. Studies adopting knowledge generated from this project may contribute to vaccines and therapies for infectious diseases. The project outcomes will be disseminated via popular news outlets, engagement with community groups and media releases from the Doherty Institute and the University of Melbourne.					
	The University of Melbourne	1,095,066.00	2,174,078.00	2,178,487.00	1,099,475.00	6,547,106.00
Victoria University						
DE250100211 Yin, Dr Jiao	**Blockchain-Enhanced Federated Learning for Secure Edge Computing** This project aims to address the pressing requirement to secure edge computing applications across diverse sectors such as healthcare, transportation, and manufacturing, which are gaining significance in Australia and worldwide. This project expects to generate new knowledge in federated learning by combining blockchain and graph modelling technologies, aligning with national cybersecurity priorities and contributing to a safer digital environment for individuals, businesses, and critical infrastructure. Expected outcomes include improved edge computing performance, privacy preservation, and attack resistance for both internal and external threats, benefiting the Australian community and supporting the nation's digital transformation.	81,388.50	160,277.00	157,777.00	78,888.50	478,331.00
	National Interest Test Statement Australia, like other nations, is witnessing the proliferation of intelligent edge devices and the widespread adoption of edge computing applications across various sectors, including critical domains like healthcare and smart infrastructure. Addressing the critical security and privacy challenges inherent in these domains is essential for Australia's national interest, particularly in the current climate of data breaches, aligning with the Strategic Science and Research Priority under Cybersecurity - Improving cybersecurity for individuals, businesses, government, and national infrastructure. This project tackles these challenges by developing an innovative framework that combines blockchain, federated learning, and graph modelling, tailored explicitly for securing edge computing applications. It emphasises privacy preservation and system resilience through safeguarding against a spectrum of threats, such as model poisoning attacks, malicious insider threats and single-point failure. Beyond academia, we look forward to sharing our findings broadly and working with businesses and policymakers across the country to ensure strengthened online security for all. Australia is on the brink of a digital transformation, and our research aims to lead the way towards a safer, smarter, and more secure digital environment for all Australians.					
	Victoria University	81,388.50	160,277.00	157,777.00	78,888.50	478,331.00
	Victoria	4,261,236.00	8,550,959.50	8,595,844.50	4,306,121.00	25,714,161.00

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Western Australia						
Curtin University						
DE250100199	**Complex Networks and Systems Theory for the Public Information Environment**	70,603.50	148,939.00	156,539.00	78,203.50	454,285.00
Ye, Dr Mengbin	This project aims to investigate how emergent threats, such as disinformation and coordinated influence campaigns, impact the broad environment in which the general public shares and consumes information. This will be done by advancing mathematical models that can study the impact of such threats on the information environment, using an interdisciplinary array of techniques from complex networks, systems theory, and social psychology. Expected outcomes include development of new strategies for securing the information environment, and building Australia's capacity to address future threats. Significant benefits are expected, including expert advice for Australian policymakers and a more secure information environment for all Australians.					
	National Interest Test Statement					
	The information environment is the complex socio-technological system through which society's citizens generate, consume and share information, and participate in public discourse. In Australia and other democratic countries, the information environment faces sustained and increasingly sophisticated foreign influence and disinformation threats. Currently, there are no tools to investigate how such threats to the information environment can undermine and damage Australian society. This project will develop new mathematical models to study the impact of such threats, and design whole-of-system strategies to increase the robustness and resilience of the information environment against them. The knowledge generated will fill a critical gap, complementing existing research on misinformation detection and individual-based interventions. The outcomes of this research have strong potential to be implemented by collaborators in Australian Defence, through knowledge transfer, modelling tools and advice to government stakeholders to enhance situational awareness and decision making. The new knowledge and end-user applications will bring significant social, economic, and cultural benefits to Australia by contributing to a secure information environment for all Australians to enjoy and access. The project will also address a current critical gap in Australia's sovereign capabilities to protect its information environment by building domestic capacity and expertise.					
DE250100223	**High-Voltage Proton Batteries Operating at Ultralow Temperature**	67,948.50	138,397.00	140,897.00	70,448.50	417,691.00
Zhong, Dr Yijun	This project aims to develop proton batteries with higher energy density that are capable of stable operation at ultralow temperatures. Based on a first proposed all-phosphate electrodes-electrolyte configuration, this project develops a new category of transition metal phosphate electrodes and promotes their capability of fast charging and discharging at ultralow temperatures. The project develops methods to suppress side reactions, enabling high-voltage output of the proton batteries. The project is expected to provide an advanced understanding of the electrochemical process in the proton batteries. These outcomes will contribute to the positioning of battery research and the development of the mining and battery industry in Australia.					
	National Interest Test Statement					
	Proton battery is a new alternative technology to a lithium-ion battery, which has lower manufacturing costs, better safety, and a good balance between capacity and instant power output. In previous research, the proton batteries have limited energy density due to the relatively low voltage output. This project aims to develop high-voltage proton batteries with higher energy density capable of stable operation at ultralow temperatures. The project outcomes include a new category of transition metal phosphate electrodes and an advanced understanding of the electrochemical process in proton batteries. The preparation and application of the new materials and proton batteries in this project do not involve chemicals or processes that have a significant negative environmental impact. The project outcomes have a high potential for technology adoption as they provide an alternative option for highly efficient, stable and safe energy storage, especially suitable for applications utilised in environments at ultralow temperatures. The production of the materials and the batteries does not require large investments for adapting available facilities in the battery and fuel cell industry. Subsequent technique adoption and commercialisation will contribute to enhancing the value-addition of mineral products from Australia's world-leading mining industry and driving the economic development of Australia in the long term.					
DE250100236	**Next-generation floating hybrid offshore wind-wave energy conversion system**	71,748.50	138,947.00	138,947.00	71,748.50	421,391.00
Zuo, Dr Haoran	This project aims to integrate floating offshore wind turbines and wave energy converters into a unified system to concurrently capture wind and wave energy. The existing understanding of the coupled dynamics within this innovative system and the interactions between these two energy units is limited. This project intends to develop a reliable and effective method to predict the					

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	dynamic performances of the system under compound wind-wave-current fields and develop advanced vibration control technologies to ensure its workability and survivability under harsh environments. The outcomes will contribute significantly to the reduction of energy costs and foster harvesting integrated wind and wave technologies on both national and global scales. **National Interest Test Statement** Offshore wind and wave energy offer compelling alternatives to traditional fossil fuels. The offshore wind industry has experienced rapid growth worldwide, driven by falling costs and the significant increase in turbine size and project scale. Globally, 2030 targets for offshore wind total around 200 GW. Australia, with its extensive coastline, is in a transition towards cleaner and more sustainable energy sources and the offshore wind and wave energy sector is emerging as a promising and evolving field. While commercial wind farms predominantly consist of fixed foundation turbines in shallow waters (<60 m), Australia possesses substantial resources in deeper waters (>60 m), which are better suited for floating technologies. Due to the complex dynamics and challenging marine environments, the development of integrated floating wind and wave technologies is still in its early stages. This project will evaluate and enhance the dynamic performances of a system that combines a floating wind turbine with wave energy converters. The outcomes will be translated into a novel guidance method for industries, enabling the design of hybrid energy conversion systems to maximise power output, as well as effective protective technologies to mitigate the consequences of downtime and potential catastrophic structural failure. Through this project, Australia will take a leading role in renewable energy research, contributing to the global mission of achieving net-zero carbon emissions by 2050.					
DE250100342 Li, Dr Huan	**Critical and precious metals recovery from e-waste** The project aims to recover critical and precious metals from waste electronic printed circuit boards (PCBs) through a new and sustainable leaching process utilizing green organic ligands. Australia exports most of its waste PCBs after initial processing, with a significant loss of material value. The expected outcomes of this project include a new fundamental understanding of the chemistry behind coordinate leaching systems and the development of an eco-friendly, cost-effective, and industrially viable recycling process. The project will contribute to public health and environmental sustainability, create domestic waste processing capacity, and reinforce Australia’s obligation in the Basel Convention to avoid e-waste export. **National Interest Test Statement** Australia is amongst the highest producers of e-waste per capita in the world. Most of this waste is either accumulated, landfilled, or illegally exported. This poses risks to human health and the environment due to the hazardous substances. Moreover, the Australian e-waste recycling industry focuses on low-value processing and its capacity to recover valuable metals is very limited due to the lack of viable technology. This project will collaborate with industry to deliver a new process that is suitable for economic recovery of critical and precious metals, contributing to public health and environmental sustainability, supporting the recent e-waste landfill bans, creating domestic waste processing capacity, and reinforcing Australia’s obligation to the Basel Convention by avoiding e-waste export.	79,487.50	160,436.00	154,549.00	73,600.50	468,073.00
DE250100674 Chen, Dr Yongqiang	**Green Lithium Mining from Granite Reservoirs** This project aims to understand lithium enrichment in granitic aquifers, a promising source of green lithium that is more economical and environmentally friendly to extract than hard rock lithium. The project will develop a mechano-geochemical theory to unravel how in-situ stress triggers lithium leaching and flow channel opening in granite. The expected results are a cutting-edge mathematical model and advanced experimental X-ray imaging demonstrations, which will inform a technology roadmap to unlock green lithium resources in Australia and strengthen Australia's leadership in critical mineral mining. **National Interest Test Statement** Lithium is an essential metal for rechargeable batteries. Australia has the largest lithium exporting industry, earning $1.6 billion in 2022 and providing thousands of jobs. However, conventional hard rock lithium mining faces the challenges of high energy consumption for grinding rocks and billions of tons of mine tailing leftover. Failing to manage this challenge could result in high greenhouse gas emissions and pollution to water, land, and air. This project aims to overcome this challenge by identifying and developing green lithium mining, which extracts lithium from lithium-rich aquifers in granite reservoirs without milling rocks into a powder. Through developing a new theory and collaborating with Australia’s leading mining companies, this project can transfer knowledge to practical procedures and register intellectual properties (IPs) for green lithium exploration. This will enable Australia to unlock its green lithium resources and boost its market share in the burgeoning renewable energy era. Additionally, the method developed should have broad applications to other critical minerals in granite, such as uranium and rare earth elements (REEs). This project is committed to supporting a strong economy, resilient society, and sustainable environment for the interests of Australians.	79,901.00	152,828.50	139,516.00	66,588.50	438,834.00
DE250100685	**Addressing alcohol use and injury in Australia's ageing population**	77,500.00	155,000.00	155,000.00	77,500.00	465,000.00

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
Gilmore, Dr William T	Alcohol use in Australia’s rapidly ageing population is an enormous and growing public health challenge that can be reduced or prevented through evidence-based practice and policy. This research aims to build new knowledge that informs and enables alcohol policy change that maximises health and wellbeing and minimises the $67b annual health and injury burden of alcohol. This will provide major health and social benefits for an often overlooked population and sustainable economic benefits for governments and communities. Expected outcomes include a community-focused interactive visual online tool to address gaps in our knowledge and enable policy change to reduce alcohol’s major impact on older Australians, our health system and communities. **National Interest Test Statement** Australia’s population is ageing rapidly and, despite a policy focus on young people’s drinking, there are concerning and persistent upward trends in alcohol consumption and alcohol-related harm among our over 50s. My research vision is to establish a new scientific evidence base of community-level information to educate communities, governments, advocates, health practitioners and policy makers about alcohol’s impact on injury in our ageing population. Outcomes will advance understanding of an unaddressed problem and inform targeted policy and practice responses to prevent and reduce avoidable injury. My research will enable change to address alcohol’s $184m daily social and economic burden in Australia, leading to major health and hospital savings for government, improved safety for communities and overall better health and wellbeing for individuals and their families. To enhance understanding, impact, translation, and adoption of research, I plan to extend reach of the findings by establishing a community-centric, consistently updated website to convey meaningful insights for diverse stakeholders into alcohol-related issues and injuries. The dissemination strategy encompasses tailored outreach efforts directed at community groups, policy practitioners, and decision-makers through a multifaceted approach that includes stakeholder engagement and strategic use of social and other media. My research will contribute to informed decision making and a positive impact on society.					
DE250101046 Xu, Dr Qiucheng	**Thiol ligands modified Cu catalysts for high-rate CO2 reduction to ethanol** This project aims to revolutionize ethanol production to achieve high-current density CO2 electrolysis to ethanol in bipolar-membrane-driven CO2 electrolysers powered by renewable electricity. The project's ground-breaking advancements will encompass rational design and engineering of thiol ligands, elucidation of reaction mechanisms, potential breakthroughs in CO2 electrolysis. Outcomes include in-depth reaction mechanism understandings, demonstration of robust CO2 electrolysers and innovative materials engineering methods. The approach holds immense potential to transform the ethanol industry, foster economic growth, and contribute to a sustainable energy future. **National Interest Test Statement** This project promises substantial academic contributions by advancing our understanding of surface modification in electrochemical CO2-to-ethanol conversion—an underexplored electrocatalysis field. These insights will have broader implications in various electrochemical conversion areas, including water electrolysis and electroreduction for ammonia formation. In the near term, it nurtures the next generation of Australian talent by training one PhD student and two honours students in catalyst design and CO2 electrolysis. Moreover, it leverages on Western Australia's transition metal resources, fostering growth in manufacturing and the chemical sector. Within 5-10 years the synthesis of cost-effective, high-performance Cu catalysts for ethanol production is expected to create employment opportunities and propel the development of ethanol storage, utilization, and export, potentially reaching a market size exceeding 2 billion AUD. This project aligns with Australia’s energy security and economic strength by producing ethanol from CO2 via renewables, contributing to the National Science and Research Priorities in Energy by addressing energy security and economic strength through renewable ethanol production from CO2. It also contributes to a cleaner energy future by addressing the goals of low emission fuels and technologies in the Transport sector and Australia's commitment to net-zero CO2 emissions by 2050, bolstering Australia’s long-term energy sustainability.	77,948.50	155,647.00	145,397.00	67,698.50	446,691.00
DE250101434 Guan, Dr Daqin	**Protonic ceramic fuel cells for operation under <400 °C** This project aims to address the poor efficiency of ceramic fuel cells at intermediate temperatures by developing new and advanced electrolyte materials. This project expects to generate new knowledge in the area of ceramic fuel cells at reduced temperatures using a new mechanism and material system. Expected outcomes of this project include the development of a new material system, the establishment of a new mechanistic study method, the elucidation of a new mechanism, and the breakthrough of the performance of ceramic fuel cells at intermediate temperatures. This should provide significant benefits for Australia’s emerging hydrogen industry across all levels of implementation.	78,448.50	156,897.00	152,897.00	74,448.50	462,691.00

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Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)			Total ($)
(Columns 1 and 2)	(Column 3)	2024-25 (Column 4)	2025-26 (Column 5)	2026-27 (Column 6)	2027-28 (Column 7)	(Column 8)
	National Interest Test Statement To date, a fuel cell for hydrogen use that can effectively operate at 250~400 °C in Australia is still unavailable. This project is about applying a new mechanism and a new electrolyte material system in the protonic ceramic fuel cell (PCFC) to address this research gap. This project will realize efficient, robust, and economical use of hydrogen, which could help develop Australia's bottleneck hydrogen use field, gradually reduce the reliance on non-renewable fossil fuels, alleviate related energy and environmental issues, create more jobs regarding sustainable energy technologies, and improve Australia's competitiveness in the global carbon-neutral economy. Additionally, this project will succeed in lowering the operating temperature of PCFC to <400 °C, which can help expand the compatibility with inputs, strengthen the balance of the plant, and further reduce the system cost. Besides the academic contribution, cooperation with the hydrogen industry will be gradually established in the future since Australia has a great foundation for the future commercialization of PCFC.					
	Curtin University	603,586.00	1,207,091.50	1,183,742.00	580,236.50	3,574,656.00
The University of Western Australia						
DE250100125 Pessarrodona Silvestre, Dr Albert	**Emerging blue carbon pathways as natural climate solutions** This project aims to uncover whether two previously-overlooked pathways of the coastal carbon cycle can provide climate mitigation benefits. Using innovative experiments and oceanographic modelling, this project will quantify coastal carbon injection to the deep sea and carbon storage in unvegetated shelf sediments, helping solve outstanding questions regarding the role of coastal vegetated ecosystems in the ocean carbon budget. Project outcomes will deliver robust models for cost-effective carbon accounting, and a tool to verify the climate benefits of managing coastal ecosystems. This will facilitate the development of novel climate mitigation activities, positioning Australia at the leading edge of ocean-based climate action.	81,318.50	159,047.00	157,992.00	80,263.50	478,621.00
	National Interest Test Statement Managing ecosystems to remove and store more carbon lies at the core of Australia's nature-based climate change mitigation strategy. Protecting the carbon exported from coastal ecosystems to the deep sea, or the carbon stored in continental shelf sediments, is a promising avenue for new climate action. Yet, accurately measuring the amount of carbon removed and stored beyond the coastal zone remains challenging. This research will quantify the carbon transported from mangrove forests, seagrass meadows, and seaweed beds to the deep sea, establishing a more complete picture of the carbon cycle of coastal ecosystems. It will also map the carbon stored across Australia's offshore marine sediments and its vulnerability to human disturbance. This project is of national significance because it will deliver high-resolution carbon stock data for Australia's first National Ocean Account and expand the nature-based ways Australia can fight climate change. Project outcomes will facilitate the development of ocean-based climate mitigation activities in the emerging Australian voluntary carbon market by creating cost-effective carbon accounting models and a tool to verify carbon removal in coastal regions. This project is of global significance because it will provide fundamental understanding of the coastal carbon cycle, enabling more accurate modelling and carbon budgets of the ocean.					
DE250100309 Dodd, Dr Matthew S	**Uncovering the evolution of the nitrogen cycle with carbonate chemistry** Nitrogen is essential for all life on Earth, but current methods are unable to quantify many aspects of the evolving nitrogen cycle, impeding our understanding of its effects on ecosystems and environmental change. This project will pioneer a groundbreaking method using nitrogen species trapped inside carbonate minerals to directly measure ocean nitrogen abundances and isotope compositions over Earth history. The new method developed by this project will revolutionize our grasp of complex patterns in the nitrogen cycle and its effects on life and Earth. These insights will not only bolster foundational scientific knowledge but also pave the way for informed environmental interventions and further discoveries in environmental science.	77,948.50	155,997.00	159,447.00	81,398.50	474,791.00
	National Interest Test Statement The nitrogen cycle is a vital part of Earth's ecosystems and environment, but current methods are unable to quantify many aspects of the evolving nitrogen cycle. This project will develop a ground-breaking method to study Earth's nitrogen cycle and its impact on ecosystems and environmental change. The new method developed in this project will result in discoveries regarding the connections between life, environmental change and the nitrogen cycle, which will provide Australians with diverse benefits over time. For example, understanding how nitrogen cycling behaved during periods of extreme climate change will be economically beneficial, as it could lead to new marine management systems to reduce greenhouse gas emissions of N2O and reduce health costs associated with climate change. Environmentally, it may help better manage water and marine systems during environmental change, potentially securing marine food supply. Insights into the nitrogen cycle can also be transformative for ecosystems like coral reefs which rely on nitrogen and are biodiversity and tourism hotspots. New discoveries about the nitrogen cycle resulting from this project will become accessible to policymakers, and industry through scientific literature and workshops. It will be accessible to the general public on digital platforms and					

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	media, ensuring the research's insights permeate society, leading to broader understanding and practical applications of nitrogen cycling and its benefits to Australia.					
DE250100347	**Mapping the structure-function relationship of DNA origami in cells**	81,298.50	162,649.00	162,799.00	81,448.50	488,195.00
Kretzmann, Dr Jessica A	DNA origami enables the precise design and creation of nanoparticles of any size and shape with unprecedented control. However, there is limited fundamental knowledge regarding the interactions between DNA origami nanotechnology and the intracellular environment. The proposed project will address this significant knowledge gap and dissect the structure-function relationship between DNA origami nanotechnology and the intracellular environment. The effect that material properties, such as size, shape and sequence, have on the stability, and fate of DNA origami objects in cells, will be elucidated. This multidisciplinary work will advance knowledge in bionanotechnology and cell biology, for engineering functional nanomaterials.					
	National Interest Test Statement Although in its infancy, the global DNA nanotechnology market is growing at a rate of over 10% per year, and is set to surpass USD$88 million by 2031 with applications across computing, robotics, light, energy, agriculture, sensing and diagnostics and biotechnology. Together governmental bodies, universities, and biotechnology industries across Europe, Asia and North American are significantly investing in DNA nanotechnologies. Yet, there are still several significant questions surrounding how these DNA nanoparticles interact within cellular environment, how long they remain in the cell, and where they localise. These questions limit further widespread research and adoption of the technology, particularly for biotechnology applications. The proposed research will investigate the relationship between DNA nanotechnology and the internal cell environment, to enable better design and engineering of functional materials. The project will advance both basic and practical knowledge at the forefront of DNA bionanotechnology, and cell biology. The research program brings together expertise in chemistry, nanotechnology, cell biology and advanced imaging to achieve the proposed overarching goals. We will provide training to the research community at the cutting edge of cross-disciplinary science. The outcomes from the project will also deliver intellectual property, positioning Australia at the forefront of DNA nanotechnology and enabling translation to industrial applications.					
	The University of Western Australia	240,565.50	477,693.00	480,238.00	243,110.50	1,441,607.00
	Western Australia	844,151.50	1,684,784.50	1,663,980.00	823,347.00	5,016,263.00
		15,537,283.00	**31,062,884.50**	**30,960,781.00**	**15,435,179.50**	**92,996,128.00**