# Minister's Approval for Discovery Early Career Researcher Award for Funding Commencing in 2023 Schedule

| Approved Organisation, Leader of Approved Research Program | Approved Research Program | Estimated and Approved Expenditure ($) | | | Indicative Funding ($) | Total ($) |
|---|---|---|---|---|---|---|
| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **Australian Capital Territory** | | | | | | |
| **The Australian National University** | | | | | | |
| DE230100003 | **The evolution of venom and its role in shaping biodiversity** | 74,748.00 | 134,055.00 | 118,938.50 | 59,631.50 | 387,373.00 |
| Esquerre, Dr Damien | This project aims to study how venom, nature's most powerful weapon, evolves and shapes biodiversity. Using the iconic Australian and New Guinean venomous snakes as a model, this project expects to develop a novel approach to profile venom composition from museum specimens, test competing hypotheses on the evolution of venoms, and test for the association between the evolution of venoms and the evolution of diversity in species richness and morphology. Expected outcomes include the largest venom database for any animal group and a better understanding of how venoms evolve and what role they play in earth's biodiversity. The generated venom data has potential to be used in future studies to aid in the development of anti-venoms and drugs. | | | | | |
| | **National Interest Test Statement**<br>Australia is home to the largest and most diverse venomous snake group in the world, yet we know the venoms of very few of them, leaving an untapped resource for drug discovery. Venom-based drugs already treat conditions ranging from cancer, arthritis, stroke and heart disease. A more comprehensive knowledge of the venom composition of Australia's snakes has potentially life-saving implications. Using a new method to profile venom composition, this project will represent a world-first by uncovering the venom of almost all Australian venomous snakes, which will be used to answer questions about changes in our snake population. The findings will be translated into a free online database, containing the hundreds of toxins identified for each of 187 snake species. This critical resource will be used in future drug discovery research and leveraged by the pharmacological and medical sectors in the form of life-saving drugs and in therapeutic treatments. In so doing, the project will contribute fundamental research to the future health of Australians. | | | | | |
| DE230100014 | **Comparative genomics to improve conservation planning in Australian deserts** | 77,808.50 | 156,861.50 | 138,426.00 | 59,373.00 | 432,469.00 |
| Pepper, Dr Mitzy R | This project aims to locate hotspots of diversity in Australia's vast, flat deserts and to quantify how well these areas are captured under the National Reserve System. I will establish a network of international and national collaborators and improve knowledge on how animals responded to past environmental change. The anticipated outcome of this project is to improve our ability to understand, measure and preserve our unique desert biodiversity and the evolutionary processes that sustain it, using our remarkably diverse reptile fauna as a model system. In the face of current, rapid environmental change, this has never been more important, and will provide a tool for biodiversity survival. | | | | | |
| | **National Interest Test Statement**<br>In the face of rapid environmental change, Australia needs to protect and conserve our animals and plants to ensure their future survival. For this reason, the Australian Government's 2021-2031 Threatened Species Strategy and Australia's Strategy for Nature has prioritised the need to identify and protect places that sustain our unique biodiversity. However, we do not know where these important areas are across vast inland Australia - putting a significant and unique portion of Australia's animals and plants at risk of extinction. Using cutting edge genomics and analysis methods, this project will locate hotspots of genetic diversity, identify how well Australia's National Reserve System protects it, and highlight opportunities to improve conservation outcomes. By identifying these areas for policy makers and land managers, including Traditional Owners, and supporting them to utilise the findings, the project will equip Australia with the knowledge needed to more accurately and effectively protect its globally unique biodiversity amidst worldwide climate change. | | | | | |
| DE230100025 | **Probing Antarctic Ice Sheet by Correlation Seismology** | 72,768.50 | 142,670.00 | 139,803.00 | 69,901.50 | 425,143.00 |
| Pham, Dr Thanh Son | This project aims to advance research on the internal structure and temporal change in the Antarctic ice sheet by analysing seismic ground motion records of natural sources, including ambient noise. This approach expects to complement existing satellite and airborne methods to resolve glacial structures over large areas and detect changes hidden under snow cover. The intended outcome is new knowledge of the ice sheet's stratification, its long-term variation due to climate change, and its rapid response to local weather events. The benefits include improving the reliability of ice sheet evolution modelling and sea-level rise prediction, unlocking a polar gateway to study Earth deep interior, and preparing for space missions to icy worlds. | | | | | |

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| | **National Interest Test Statement**<br>Advanced monitoring of the Antarctic ice sheet, a part of Australia's research priority to monitor environmental changes, will play a critical role in environmental sciences in the following decades. This project will deploy and further develop an arsenal of cutting-edge seismological methods, which have proved remarkably successful in monitoring environmental changes elsewhere, to analyse the valuable Antarctic seismic dataset collected via extensive national and international collaborations. It will advance knowledge about the internal structure of the ice sheet and its responses to climate change and short-term weather events. These results will increase the reliability of ice-sheet evolution modelling and related sea-level rise prediction, which will help preparations against the risk of inundation along the Australian coastline in the following decades as ice melts. Further, cutting-edge research in the Antarctic ice sheet will attract public interest, enhance climate change awareness in the Australian community, strengthen the presence of Australia and protect its national interest in the continent. | | | | | |
| DE230100054<br>Levitina, Dr Galina | **Spectral estimates in the presence of a magnetic field**<br>Estimates on eigenvalues of integral operators are at the core of numerous results in the study of quantum phenomena and in associated mathematical fields. This project aims to establish detailed spectral properties of the integral operators arising in quantum models incorporating magnetic fields. An anticipated goal is the generation of new and significant theoretical results in analysis that will open novel approaches to the use of magnetic differential operators. This is expected to benefit Australian science by invigorating collaboration between mathematics and theoretical physics, by providing research training relevant to emerging quantum science based technology and strengthening research collaborations with world leading scientists. | 72,000.00 | 144,000.00 | 144,000.00 | 72,000.00 | 432,000.00 |
| | **National Interest Test Statement**<br>Quantum theory helps us understand the microscopic world of the smallest units of matter. By gaining a better comprehension of how this works, we can radically improve technologies across many platforms, such as solar panels, lasers, microscopes, MRI scanners and mobile devices. This project will advance our mathematical understanding of the conductive properties of quantum materials. In gaining a deeper knowledge of how these materials work, we can learn how to use them to make new and improved technologies. This research will support mathematicians and theoretical physicists to provide a basis for Australia’s quantum technology sector to benefit commercially in the future, through their design of cutting-edge nano-electronic and quantum devices. This will ensure Australia sees a return on its long-standing investment in quantum materials science, and secure its leadership in the quantum technology sector worldwide. | | | | | |
| DE230100070<br>King, Dr Gemma S | **Signs on Screen: Language, Culture and Power in Sign Language Cinema**<br>This project aims to discover how contemporary screens represent deafness and how sign language cinema filters Deaf and non-ableist perspectives. Partnering with Deaf Connect and the National Film and Sound Archive, this project expects to provide a transnational, transdisciplinary framework for analysing Deaf language and culture on screen in terms of completeness and empowerment. Expected outcomes include capacity building for emerging Deaf scholars, inclusive innovations in film and language studies and new opportunities for Deaf/hearing dialogue and cohesion. This should lead to diverse benefits such as increased Deaf wellbeing and enhanced capacity to harness screen cultures to support and reflect the diversity of Deaf experience. | 77,250.00 | 155,050.00 | 155,300.00 | 77,500.00 | 465,100.00 |
| | **National Interest Test Statement**<br>In the Covid era, sign language interpreting is more present on Australian screens than ever, Auslan enrolments are at their highest and Deaf filmmaking has reached a historic peak. Yet Deaf screen culture is little understood, and greater Deaf/hearing cultural cohesion is required in society. Working in collaboration with the National Film and Sound Archive and Deaf Connect, this project will analyse global sign language cinemas to generate new understandings of the diversity of Deaf experience. It will deliver the world’s first collection of sign language film, significantly expanding knowledge about deafness and sign language on screen, and positioning Australia as an international hub for sign representation in culture, art and education. It will boost the social impact of the public screen sector and generate opportunities for Deaf/hearing dialogue. The project has the potential to improve sign education and cultural representation of Deaf communities, and to foster understanding in hearing communities, leading to increased inclusion, cohesion and wellbeing for both Deaf and hearing Australians. | | | | | |

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| DE230100077 | **A geospatial toolkit to assess community risk to environmental change** | 70,683.50 | 145,967.50 | 150,284.00 | 75,000.00 | 441,935.00 |
| Lal, A/Prof Aparna | This project seeks to strengthen our understanding of the role of environmental change in driving patterns of community risk, by building a spatially and temporally explicit model, and a risk index that will be designed with input from decision makers. This project expects to improve the implementation of geospatial tools for risk assessment using an innovative approach based on evidence and practice. Expected outcomes include increased and optimal implementation of geospatial data in Australian systems, and enhanced research capacity to proactively respond to environmental change. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Global environmental change is an enduring challenge for society. Geospatial models, while well recognized for their significant value in improving decision making and identifying areas for the targeted allocation of resources, are rarely designed with input from stakeholders. This research will systematically examine how short-term variations in heavy rainfall, changes in forest cover, socio-economic factors and health service availability interact to drive patterns of community risk from current and future environmental change. In addition, the study will provide new knowledge on the information needs of decision makers and integrated this quantitative and qualitative information into a risk index developed with end users. Together, this practice-based evidence will inform current practice, and in doing so, unlock the potential for geospatial information to reduce community risk, and protect Australians from the impacts of future environmental change. | | | | | |
| DE230100085 | **Forensic genomic toolkit for tracking the illegal wildlife trade** | 74,220.50 | 146,355.00 | 146,256.50 | 74,122.00 | 440,954.00 |
| Olah, Dr George | This project aims to analyse the illegal parrot trade by utilising conservation genomic approaches. The project will reveal wildlife trade routes in South-east Asia by developing cutting-edge forensic genomic techniques and criminological methods. Expected outcomes of this project include new field-deployable sequencing technology to provide in-situ genetic information for identifying the taxonomy and provenance of confiscated specimens, and a first ever genetic database of traded wildlife. The project will facilitate important countermeasures to the illegal wildlife trade including confiscation, reintroduction, improved law enforcement, and education for better biodiversity outcomes in our region. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The illegal wildlife trade is a global threat to biodiversity, affecting numerous endangered species in the Australasian region, and an important public health issue as the trade can facilitate the transmission of zoonotic diseases. Better tools are needed to understand the illegal wildlife market including where animals are captured and sold, and to map the trade routes. This project will construct the first ever genetic database of traded wildlife by merging cutting-edge forensic genomic and criminological tools. The genomic methods developed by the project will be low cost, directly applicable to in-situ testing scenarios, and facilitate pro-active countermeasures against the illegal wildlife trade (confiscation, policy, and law enforcement). The outreach plan includes audio-visual communication tools aimed at local people, the wider public, and decision makers, and training for law enforcement authorities. Through this research, Australia will play a leading role in capacity building against the illegal wildlife trade in our region, and in combating the spread of zoonotic diseases. | | | | | |
| DE230100197 | **In one zeptosecond: quantifying energy dissipation in heavy element fusion** | 73,000.00 | 146,000.00 | 146,000.00 | 73,000.00 | 438,000.00 |
| Cook, Asst Prof Kaitlin J | This project aims to understand the process of energy dissipation in superheavy element fusion reactions. Using state-of-the art facilities unique to Australia, the first detailed measurements of the crucial early stages of these reactions will be made. This is expected to generate significant fundamental knowledge on why some superheavy element fusion reactions succeed, and why others fail. The outcomes are expected to significantly advance the fundamental understanding of nuclear reactions, and provide key guidance to international opportunities to create new superheavy elements and isotopes. Expected benefits include improving cancer treatments, understanding element abundance in the universe and improved safety in nuclear technologies. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project aims to provide the most efficient path to make new chemical elements on Earth. It will do so by examining what happens when atomic nuclei (the cores of atoms) collide and come close enough to touch on the way to making a new element. This project will use equipment and ideas that are unique to Australia. This research aims to significantly improve our knowledge of the collisions of atomic nuclei. This will lead to better cancer treatments and safer energy production. A better understanding of nuclear reactions is also needed for all applications of nuclear science in Australia's priority areas, such as defence and space exploration. Increasing Australia's nuclear expertise will help advance our national interests in security, foreign affairs, medicine and future global energy needs. | | | | | |

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| DE230100415 | **Rigidity and boundary phenomena for geometric variational problems** | 70,359.00 | 140,718.00 | 140,718.00 | 70,359.00 | 422,154.00 |
| Zhu, Dr Jonathan J | The proposed project aims to investigate theoretical properties of thin films and fluid interfaces, which are modelled as surfaces driven by surface tension, possibly in an enclosing container. This project is expected to generate new knowledge in the area of geometric partial differential equations, by utilising new techniques in geometric flows, and by establishing novel methods for boundary value problems. The developed techniques may have far-reaching applications in other areas of mathematical analysis, and the expected results would contribute greatly to the theory of surfaces governed by mean curvature, which arise in various real-world phenomena such as soap bubbles, black hole horizons and bushfire fronts. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | As a bushfire prone country, Australia relies on its fire control capabilities for limiting widespread destruction. To control fires effectively, authorities need accurate modelling of bushfire fronts – it enables them to identify threats early, issue bushfire warning messages to communities, signal evaluations and initiate fire suppression activity. This project studies the mathematical theory of curves and surfaces, which govern a range of phenomena in science and technology, including the development of a bushfire front. This project will create new theory for the geometry of surfaces which interact with a barrier, such as a bushfire front meeting the coastline, which existing theory and models cannot adequately handle. By developing new techniques and theory, and collaborating with applied mathematicians who work hand-in-hand with industry, the project has the potential to contribute in the long term to Australia's environmental protection by enabling more sophisticated fire-front modelling. | | | | | |
| DE230101064 | **Un/making homeland: Sinophone literature and Cold War culture in Malaya** | 76,500.00 | 154,000.00 | 134,000.00 | 56,500.00 | 421,000.00 |
| Show, Dr Ying Xin | This project aims to advance understanding of Cold War culture and decolonisation through Chinese diaspora experience and literature. By unearthing a corpus of underexplored archives, using literary analysis and ethnography, this interdisciplinary project offers the first comprehensive study of Sinophone literature and print culture in Cold War Malaya. Expected outcomes include new knowledge of how Chinese diaspora writers claim subjecthood amidst anti-communist violence in Southeast Asia, which shed light on the complex interplay of geopolitics, literature and identity. This project benefits Australian understanding of Chinese diaspora responses to global superpower rivalry during the 'old' Cold War amidst a similar phenomenon today. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | What is it like being Chinese in Australia now, in the light of intensifying diplomatic tensions? This project will examine how Chinese people living overseas negotiate their cultural and national identity in their adopted home country. Through an analysis of underexplored archival and oral history literature during the Cold War, the project will examine the various cultural influences on Chinese living abroad. Insights provided will benefit Australian understanding of Chinese migrant responses to global superpower rivalry during the 'old' Cold War, which has clear parallels with the situation today. This will be the first comprehensive study of archived Chinese literature and print culture in Cold War Malaya. A visual documentary created as part of this project that is available to the community through public archives, libraries and museums will encourage and promote awareness of the lives and perspectives of overseas Chinese. In the longer term, this knowledge contributes to improved social cohesion and understanding of Chinese migrant communities in Australia. | | | | | |
| DE230101151 | **Harnessing social norms to find a socially acceptable energy transition** | 74,524.50 | 151,346.50 | 152,741.50 | 75,919.50 | 454,532.00 |
| Colvin, Dr Rebecca M | This project aims to discover the potential of social norms to enable energy-producing communities to explore and define a socially acceptable energy transition. By implementing and evaluating a new social norm change intervention in the Upper Hunter region, this project expects to generate new knowledge about what matters most to communities facing transition, and how norms, identities, and networks interact to enable or constrain change. Outcomes include direct input to energy transition planning, enhanced collaboration with policy and civil society, and new international research networks. This should provide significant benefits by helping Australian communities and policy-makers navigate the local impacts of global energy transition. | | | | | |

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| | **National Interest Test Statement**<br>There is a critical and urgent social need for understanding how to best support Australia's regional communities confronted by global energy transition. Both challenges and opportunities abound. Yet, amidst the conflict and controversy of public debate, little is known about what constitutes a 'socially acceptable transition' to the communities most affected. This project will implement and validate new, innovative methods that work with social norms to elicit community perspectives on a socially acceptable energy transition, via in-depth study of the Upper Hunter region. Outcomes include detailed guidance about socially acceptable energy transition planning for the Upper Hunter, with translatable principles for other regions in Australia and globally. The largest regional economy in Australia, the Hunter, will benefit from specific, nuanced, and relevant policy advice. The Australian economy broadly will benefit from innovative approaches to managing the impacts of energy transition. | | | | | |
| DE230101567<br>Samarasinghe, Dr Prasanga | **Listening to Nature: Transforming Bioacoustics through Spatial Audio**<br>This project aims to research new 3D spatial audio processing techniques to analyse natural sounds for environmental conservation, while meeting the tasks, demands and data characteristics inherent to bioacoustics. Expected outcomes include new, accurate and efficient bioacoustics computation technologies, generalisable across different terrestrial regions, species types and environment changes. These could dramatically enhance the efficacy of current bioacoustic monitoring systems while opening up new research directions. Resulting technology could be adopted for immediate tasks like the monitoring of bushfire recovery efforts, and more generally, for the management and conservation of Australian natural resources. | 74,309.00 | 149,668.00 | 152,218.00 | 76,859.00 | 453,054.00 |
| | **National Interest Test Statement**<br>Australia's 2019 bushfires caused the death and displacement of more than three billion animals. Unfortunately, the effectiveness of recovery methods depends on inefficient and unreliable manual data collection and processing. Automated methods involving cameras and audio recorders will be crucial for improved accuracy and scalability in future monitoring of species numbers, types, habitat distributions and behaviour. Monitoring via animal sounds has demonstrated enormous potential as sound travels well in darkness and is unaffected by plants and other obstructions. Combining electronics, information science and ecology, this project will develop world-first technology that uses sophisticated audio recorders on land and with drones to collect and study natural sounds. Technology transfer partnerships with industry will see the research make immediate contributions through its application to automated performance tracking of ongoing fire recovery efforts and broader conservation efforts. For example, ACT Government's Environment Division and the Australian Acoustic Observatory will be immediate beneficiaries. | | | | | |
| DE230101729<br>Käkönen, Dr Mira | **Volatile Rivers and the Infrastructure Politics in the Mekong Region**<br>This project focusses on the challenge of repurposing large-scale hydraulic infrastructures to serve climate objectives, and aims to advance understanding of changing entanglements of rivers, infrastructure, and power relations in a time of climate change. It expects to contribute novel insights into water and climate change governance within and beyond the Mekong Region. Bridging political-ecology and infrastructure studies, planned outcomes include conceptual innovations that advance critical studies on river engineering. The project should benefit policy-makers, practitioners and advocacy groups in the Mekong and in Australia seeking to improve interventions and strengthen the coping strategies of vulnerable riverine communities. | 75,429.00 | 151,286.50 | 152,397.00 | 76,539.50 | 455,652.00 |
| | **National Interest Test Statement**<br>Sustainable water management is an ongoing challenge, both in Australia and overseas. Australia has major interests in the Mekong region, which spans China, Myanmar, Laos, Thailand, Cambodia and Vietnam, and where climate uncertainty poses a key risk to sustainable development. This project will examine the risks and opportunities for repurposing large-scale dams to help with emerging water constraints. It will reveal how water infrastructure may contribute to and be impacted by extreme weather events, especially flood and drought. By sharing insights with the Department of Foreign Affairs and Trade, the project will support the government to improve Australia's strategic climate change initiatives in the Mekong. It will also help to strengthen Australia's water-energy partnerships at home in the Murray Darling Basin, and abroad, benefiting river systems, including plants and animals, farming and food production, and the communities whose lives and livelihoods depend on improved water management. | | | | | |
| | **The Australian National University** | 963,600.50 | 1,917,978.00 | 1,871,082.50 | 916,705.00 | 5,669,366.00 |

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| **University of Canberra** | | | | | | |
| DE230100132 | **Population genetics from environmental DNA to revolutionise conservation** | 74,317.00 | 148,373.50 | 145,137.50 | 71,081.00 | 438,909.00 |
| Furlan, Dr Elise M | This project aims to revolutionise conservation monitoring by developing environmental DNA tools to rapidly and efficiently extract detailed genetic data on entire populations from a simple environmental sample. This project expects to significantly enhance conservation management by providing critical information on genetic diversity and population health. Expected outcomes include new techniques to collect population genetic information with increased speed and affordability, enhancing the capacity for both industry and government to address conservation questions. This project is likely to provide significant benefits for aquatic conservation, where traditional monitoring proves problematic for many cryptic, elusive or rare species. | | | | | |
| | **National Interest Test Statement**<br>Almost one third of freshwater species face extinction while overfishing has driven one third of sharks and rays towards extinction. A lack of available data currently limits conservation investment in many aquatic species. This innovative project aims to advance the simple, non-invasive environmental DNA (eDNA) sampling method to rapidly monitor the genetic health of populations by extracting detailed genetic data from the DNA species shed into their environment. This has the potential to provide valuable data to improve the conservation of dozens of threatened Australian species, including cryptic aquatic taxa. Economically and culturally valuable fisheries are also likely to benefit from these eDNA developments to inform the genetic health and sustainability of fishing practices. This can ensure populations remain productive and healthy, contributing to the estimated $495 million per annum benefit from sustainable management policies due to positive impacts on ecological health, economic impact and catch volume. | | | | | |
| | **University of Canberra** | 74,317.00 | 148,373.50 | 145,137.50 | 71,081.00 | 438,909.00 |
| | **Australian Capital Territory** | 1,037,917.50 | 2,066,351.50 | 2,016,220.00 | 987,786.00 | 6,108,275.00 |

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| **New South Wales** | | | | | | |
| **Australian Catholic University** | | | | | | |
| DE230100300 | **Boosting high school students' interest and course taking in STEM fields** | 64,708.50 | 129,388.50 | 131,730.00 | 67,050.00 | 392,877.00 |
| Guo, Dr Jiesi | This education psychology research aims to develop and test an online motivation intervention promoting high school students' interest and course-taking in science, technology, engineering, and mathematics (STEM). The project expects to generate new knowledge of psychological and sociocultural factors (including gender) which affect STEM interest and subject choices, and which influence the effectiveness of a motivation intervention for high school students. Expected outcomes include a scalable intervention that will be effective in replenishing the STEM skills pipeline. Benefits include better information for teachers and policy makers seeking to promote and sustain students' STEM interest, thus motivating them towards STEM pathways. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The recent impacts of bushfires and COVID-19 have shown the value of an educated STEM workforce in developing solutions for response, recovery and long-term resilience. A flourishing STEM sector also benefits economic productivity and growth. However, research shows, many Australian students, especially girls, opt out of STEM coursework during high school because they think of science as being boring, hard, or irrelevant to their lives, which leads to the low proportion of STEM graduates (less than 19%) in the last decade. This project is the first study in Australia to develop and test a brief, cost-effective, and research-derived online psychological intervention to promote and sustain high school students' STEM interest and course-taking. This research is expected to yield significant practical and conceptual advances in improving the uptake of STEM education and provide a scalable online intervention program for Australian adolescents. This proposal also advances policy and practice to promote girls' interest and retention in STEM fields, thus ensuring a diverse and talented STEM workforce. | | | | | |
| DE230100573 | **Classical Traditions and Future Thinking in Late Antiquity** | 69,500.00 | 139,500.00 | 145,000.00 | 75,000.00 | 429,000.00 |
| Hanaghan, Dr Michael H | The project aims to investigate how Classical texts were used to critique traditional Greco-Roman forms of predicting the future. It will show that future thinking is critical to the function of politics and religion in society, especially in times of sustained uncertainty. The project's outcomes include a greater appreciation of the strategies Late-Antique thinkers used to confront and exploit Classical thought, the lasting impact uncertainty may have on modes of future knowledge, and the intellectual developments of Late Antiquity. The project will benefit Australian culture by offering a clearer grasp of how humans construct, manipulate, and make use of future thinking when the world undergoes significant political and social flux. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Predicting the future is challenging, especially in times of uncertainty and stress. The project will benefit Australian culture by providing a richer understanding of how humans construct, manipulate, and make use of future thinking for political gain when the world around them undergoes significant political and social flux. Through its examination of both the Late Antique and Classical traditions the project will provide modern Australians with a deeper understanding of the sources of Australian culture. To achieve its objectives, the project will create a series of outputs targeted at the Australian public and research community. These include a project website which will publicise the findings and events of the project, make its data freely downloadable; a podcast series hosted on the project website; presentations at leading centres for the study of Late Antiquity; and publications in leading academic presses and The Conversation. | | | | | |
| DE230100666 | **The Colour of Sexual Slander** | 72,786.50 | 129,384.50 | 113,151.00 | 56,553.00 | 371,875.00 |
| Lake, Dr Jessica C | This project aims to investigate the history of sexual slander in the 19th century and its relationship to ideas of race and gender. Working within legal and historical frameworks, it seeks to examine, for the first time, court files and legislative records across the USA, UK and Australia, to understand diverse women's attempts to redress sexual insults and reputational attacks, and drive law reform. Expected outcomes include international collaborations and path-breaking works of interdisciplinary history. Significant benefits are expected, including shaping policy and legal strategies in the present to combat the ongoing problem of sexual abuse and harassment, leading to improvements in women's personal safety and economic wellbeing. | | | | | |

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| | **National Interest Test Statement**<br>The sexual harassment and abuse of women is a pervasive and pressing problem in Australia. Promoting women's safety is a key priority for state and federal governments and the broader community. This interdisciplinary project will be the first investigation of the ways in which slander law was reformed in the nineteenth century and used by women of different race and class backgrounds to fight against sexually abusive and harassing speech. By translating court files and legislative records into engaging stories of personal agency linked to social movements, expected benefits include international collaboration, a path-breaking history of the intersection of gender and race relations, and informed interventions in current policy, legal and media debates about respect for women. Knowledge of women's historical agency in achieving legal reform is empowering. The project will serve the national interest by contributing significantly to policy and legal strategies to improve women's ability to redress the harms of sexual abuse, which in turn increases their workforce participation and economic wellbeing. | | | | | |
| | **Australian Catholic University** | 206,995.00 | 398,273.00 | 389,881.00 | 198,603.00 | 1,193,752.00 |
| **Macquarie University** | | | | | | |
| DE230100144<br>Huang, Dr Zixin | **Quantum-enabled super-resolution imaging**<br>The aim is to design large scale, quantum-enabled imaging systems to boost the resolution of state-of-the-art instruments by three to five orders of magnitude. Using the toolbox of quantum information and quantum optics, the project expects to generate novel methods for 2D and 3D imaging, and precision measurements that can reach fundamental limits. Imaging is critical in much of today's research. The unparalleled resolution can benefit a broad range of scientific fields, the medical and the defence sector by resolving objects otherwise impossible. This project will strengthen Australia's position as a world leader in quantum technologies by presenting solutions to overcome critical bottlenecks in imaging methods in the optical domain. | 69,559.00 | 137,918.00 | 138,018.00 | 69,659.00 | 415,154.00 |
| | **National Interest Test Statement**<br>Taking advantage of a special characteristic of light, this project will develop a new imaging technique that will boost the quality and resolution of current imaging instruments by between 1,000 and 100,000 times. The new technique will reveal details and objects not previously visible, leading to broad applications, including in medicine, defence, and astronomy. This in turn will have great social and economic benefits for the Australian community. For example: high-resolution microscopy and medical imaging will enable more accurate disease diagnosis; high-resolution imaging analyses will allow for the detection of stealth aircraft providing a military advantage to the Australian Defence Force; and applications in astronomy would be so powerful as to enable the imaging of small planets around nearby stars. This ground-breaking project aligns with the focus on quantum technologies as a priority in Australia's Blueprint and Action Plan for Critical Technologies and will support the quantum sector in Australia which is expected to deliver $4bn in economic value and create 16,000 new jobs by 2040. | | | | | |
| DE230100244<br>Burns, Dr Emma C | **The Power of Teacher-Student Relationships to Optimise Student Outcomes**<br>This project aims to determine how teacher-student relationships support adolescents' motivation, engagement, and achievement in Mathematics, Science, and English via three hypothesised dimensions: socio-emotional support, instructional help, and conflict. This project expects to generate new knowledge about the impact of teacher-student relationships in each subject, over time, and if they can be improved by intervention. Expected outcomes include an online practice-driven toolkit and scalable intervention to enhance teacher capacity to build positive relationships. This knowledge will have significant benefits for students, teachers, and policy by identifying how to enhance the relationships most critical to adolescents' academic success. | 70,741.00 | 138,123.50 | 134,620.50 | 67,238.00 | 410,723.00 |
| | **National Interest Test Statement**<br>This project will establish which elements of teacher-student relationships optimise students' motivation, engagement, and achievement in secondary school. Identifying how teachers can build and maintain the relationships that foster adolescents' academic success in the short- and long-term has significant social and economic benefits. Student disengagement and attrition cost the Australian economy $896 million annually. Students who experience positive relationships with their teachers tend to have higher engagement and achievement and are less likely to leave school. There is a high rate of teacher attrition (5% annually) in Australia. Teachers who experience positive relationships with students report less burnout and are less likely to leave the profession. By providing teachers and students with an evidence-based model to cultivate and sustain positive relationships, this project will contribute to the improvement of Australian educational systems, quality teaching, and student outcomes in the core subjects of Mathematics, Science and English, which are essential to a high calibre Australian workforce. | | | | | |

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| Approved Organisation, Leader of Approved Research Program | Approved Research Program | Estimated and Approved Expenditure ($) | | | Indicative Funding ($) | Total ($) |
|---|---|---|---|---|---|---|
| | | 2022-23 | 2023-24 | 2024-25 | 2025-26* | |
| (Columns 1 and 2) | (Column 3) | (Column 4) | (Column 5) | (Column 6) | (Column 7) | (Column 8) |
| DE230100303 | **New Foundations for Algebraic Geometry** | 58,700.00 | 117,400.00 | 117,400.00 | 58,700.00 | 352,200.00 |
| Lemay, Dr Jean-Simon P | Differential calculus is one of the most important and widely applied areas of mathematics. Differential categories are a modern foundational theory of differential calculus with applications throughout mathematics and computing. This project aims to use differential categories to create new foundations for algebraic geometry, and to generate new knowledge on the connection between algebraic and differential geometry. The generality of these foundations will allow for novel applications of algebraic geometry with significant benefits to computer science, such as in machine learning and differentiable programming. We expect this to build Australia's profile in these important fields and help train the next generation of mathematicians. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | As technology evolves, there is an ever-growing reliance on computer systems, which in turn are becoming more complex and difficult to work with. The project will study the mathematical foundations of these computer systems and solve some of the most pressing challenges that are limiting the capabilities of computer programming. This research project will develop new tools for machine learning, which in turn can be applied to the development of artificial intelligence. As artificial intelligence begins tackling real-life situations, the complexity of the problems encountered will increase rapidly. This will require the new mathematical approaches pioneered in this project to provide solutions. Through its application to computer science in collaboration with industry partners, the project will have social and economic benefits for the Australian community as the mathematical discoveries can be used by Australian industries in mining (to increase productivity), financial services (to protect against money laundering), healthcare (through assisted reproductive services), and to advance artificial intelligence. | | | | | |
| DE230100601 | **Chinese Australian Writing on Indigenous Country** | 65,011.50 | 130,526.00 | 120,689.50 | 55,175.00 | 371,402.00 |
| Xu, Dr Daozhi | This project will produce the first major study of Chinese Australian writing about Indigenous people, culture and country from the 19th century to the present. Drawing on literary, historical, and cultural studies approaches, it will provide insights into the enduring Indigenous-Chinese relationships from Chinese perspectives. It will bring to light how Chinese immigrants engage with Indigenous issues to articulate a sense of belonging. It will provide a new account of the making of Chinese Australian identity, by exploring a distinctly Chinese position between Indigenous and settler sovereignties. It will enhance understanding of the role and responsibility that Chinese Australians have towards national reconciliation. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will bring to light Chinese Australian writing about Australia’s First Nations peoples, cultures and country from the 19th century to the present. It will reveal for the first time the largely overlooked relationship between Indigenous and Chinese Australians from a Chinese perspective. The project will show how Chinese Australians have engaged with Indigenous issues and used this to express a sense of belonging and citizenship in Australia. Understanding the shared history of Indigenous-Chinese relationships will have social and cultural benefits to the Australian community by helping new Chinese immigrants better integrate into Australia, mitigating the lack of appreciation of Indigenous cultures among Chinese Australians, and providing much-needed insights into the role and responsibility of the Chinese Australian community in achieving national reconciliation. The project will offer a valuable model for other immigrant groups, and will therefore contribute to building a new pathway to reconciliation, community cohesion and resilience in Australian society. | | | | | |
| DE230100608 | **Characterising brain networks of intelligence through information tracking** | 78,549.00 | 157,602.00 | 150,356.00 | 71,303.00 | 457,810.00 |
| Karimi-Rouzbahani, Dr Hamid | For intelligent behaviour, the human brain needs to engage several processes including sensory, memory and motor processes. How it does this is one of the most significant questions in cognitive neuroscience. This project characterises the neural networks of human intelligence by advancing and building on the most recent advances in neuroimaging analyses. It will determine the interaction of different brain processes by developing novel connectivity methods that track the flow of information through the brain with high temporal and spatial accuracy. The outcomes will be fundamental insights into the mechanisms of human intelligence and new connectivity analysis software that will have wide application in brain research. | | | | | |

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

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| | | 2022-23 | 2023-24 | 2024-25 | 2025-26* | |
| (Columns 1 and 2) | (Column 3) | (Column 4) | (Column 5) | (Column 6) | (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>The project will study how the human brain engages sensory, memory and motor processes for intelligent behaviour. By tracking the flow of information through the brain with unparalleled accuracy, the project will reveal the role of cognition and brain function in supporting intelligence – a strong predictor of many life metrics ranging from educational attainment to risk of incarceration and death. Understanding the neural underpinnings of intelligence is therefore essential in understanding what it means to be human and how we can improve lives. The project will deliver a novel brain connectivity analysis toolbox (computer software) that can track the flow of distinct types of information in the brain, enabling the diagnosis and treatment of mental disorders, such as depression and anxiety, bringing social benefits to the millions of Australians who experience these mental health conditions. This project will work at the intersection of machine learning and cognitive neuroscience bringing economic benefits to Australian technology industries that work in artificial intelligence. | | | | | |
| | **Macquarie University** | 342,560.50 | 681,569.50 | 661,084.00 | 322,075.00 | 2,007,289.00 |
| **Southern Cross University** | | | | | | |
| DE230101177<br>Gatwiri, Dr Kathomi G | **Beyond Inclusion: Belonging and Racial dignity for Africans in Australia**<br>This project aims to investigate why Black Africans in Australia experience significant challenges of integration in comparison to other migrant groups. This issue of national concern, exacerbated by ongoing negative public and media discourse, has prompted calls for deportations of community members due to failed integration. Applying a unique and innovative Afrocentric methodology, this project expects to generate a new understanding of racial dignity as key to belonging for Black Africans in Australia. By linking racial dignity as core to integration and belonging, the project should expand cross-cultural understandings that may inform culturally appropriate practice approaches with members of this community. | 75,799.50 | 152,312.50 | 152,504.00 | 75,991.00 | 456,607.00 |
| | **National Interest Test Statement**<br>The recent trending #AfricanGangs social media hashtag intensified national debates in the media and parliament about 'failed multiculturalism', with some calling for Africans struggling to integrate within Australia to be deported. Despite African migrants reporting the highest cases of discrimination and exclusion in Australia, a pressing knowledge gap around 'what works' for this community remains, as evidenced by current limitations of cultural competency frameworks. The project addresses this knowledge-to-practice gap by identifying significant African practices that foster wellbeing, resilience and dignity, such as music, food and storytelling. This knowledge, drawn directly from the African community, will be used to develop a tailored, culturally appropriate practice framework for services supporting them. A highly collaborative approach will ensure the framework's adoption and application by relevant human service organisations. Tailored services for vulnerable communities such as the African community will lead to better health, social, cultural and economic outcomes and consequently increase their overall contribution to Australia. | | | | | |
| | **Southern Cross University** | 75,799.50 | 152,312.50 | 152,504.00 | 75,991.00 | 456,607.00 |
| **The University of New England** | | | | | | |
| DE230100305<br>Parry, Dr Luke A | **Revealing the origin and early evolution of spiralian animal body plans**<br>This project aims to reconstruct the early evolutionary history of the Spiralia, a megadiverse animal group that extends back 540 million years. Their oldest fossils represent some of the earliest known animals and can reveal much about the speed and magnitude of evolution during the Cambrian Explosion, when most animal groups rapidly appeared. This project expects to generate new knowledge on the origin and radiation of some of the first animal body plans to better understand the early history of complex life. Anticipated outcomes and benefits include a new macroevolutionary framework for spiralians, novel approaches to studying invertebrate fossils, and highlighting the scientific importance of Australia’s natural heritage. | 73,456.00 | 143,479.00 | 126,076.00 | 56,053.00 | 399,064.00 |

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|---|---|---|---|---|---|---|
| | | 2022-23 | 2023-24 | 2024-25 | 2025-26* | |
| (Columns 1 and 2) | (Column 3) | (Column 4) | (Column 5) | (Column 6) | (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>The fossil record shows that most animals first appeared during a unique event called the Cambrian Explosion, over 500 million years ago. By studying living and ancient fossil species, this project will demonstrate how this event unfolded in unparalleled detail, revealing how quickly animal biodiversity arose. Many important ancient fossils are known from the Flinders Ranges of South Australia, but they are difficult to study using conventional techniques. This project will pioneer a new 3D imaging method, that will unveil the anatomy and evolutionary significance of these fossils. This will bolster the case for UNESCO World Heritage Serial Site status for the Flinders Ranges, therefore showcasing Australia's geoheritage to a global audience. Through collaboration with Natural History Museums (such as at UNE), education and outreach programs will inform the public about animal origins and the contribution of Australia's unique fossils to understanding the evolution of life on Earth. | | | | | |
| | **The University of New England** | 73,456.00 | 143,479.00 | 126,076.00 | 56,053.00 | 399,064.00 |
| **The University of New South Wales** | | | | | | |
| DE230100021<br>Sun, Dr Kaiwen | **Kesterite/Si Tandem Structure for Unassisted Overall Solar Fuel Production**<br>This project aims to develop Kesterite/Si tandem device for photoelectrochemical carbon dioxide reduction to produce solar fuels. It is expected to reveal the photoelectrochemical mechanism of the p-n heterojunction, thereby promoting solar energy utilisation and greenhouse gas reduction. Expected outcomes include delivery of a high-performance kesterite photocathode for efficient CO2 reduction, a kesterite/Si tandem device for overall unassisted solar fuel production, and an in-depth understanding of structure-performance correlation to guide future heterojunction photocathode design. This project should provide significant benefits in minimising fossil fuel consumption, increasing energy security, and expanding the clean energy industry. | 73,359.00 | 146,718.00 | 146,718.00 | 73,359.00 | 440,154.00 |
| | **National Interest Test Statement**<br>The increasingly high demand for energy supply and concern to reduce global carbon dioxide production requires better ways to convert energy from renewable source and store energy in an efficient and stable manner. This project will develop a novel standalone unassisted solar fuel production system that combines renewable solar energy harvesting and solar fuel energy storage. This project will help Australia develop its future solar fuel economy and will provide great economic, commercial benefits to the nation. With respect to environmental and social benefits, the project will help enable a renewable solar fuel energy society that will reduce fossil fuel usage and carbon emissions and thus reduce air pollution that causes human health problems. Benefits will also be felt by Australian companies in the advanced manufacturing and high-tech energy conversion sectors that will potentially produce and use the developed solar fuel production system. Overall, this project will position Australia for a leading global position in the strategic technological shift to renewable energy and net-zero emissions. | | | | | |
| DE230100116<br>Moustafa, Dr Nour M | **Vulnerability Defence: From Interpretable to Trustworthy Threat Assessment**<br>This project aims to design a novel vulnerability defence framework to automatically identify, prioritise and interpret vulnerabilities and their attack vectors from the Internet of Things (IoT). Currently, most Australian organisations can be targeted by complex cyberattacks, stealing sensitive information leading to financial loss and reputation threats. This project expects to generate new knowledge in IoT vulnerability assessment using economic risk estimation and cognitive vulnerability identification methods. Expected outcomes include trusted IoT vulnerability assessment methods and vulnerability testbed. Significant benefits are expected to protect IoT networks in all defence, industry and government sectors. | 70,000.00 | 140,000.00 | 139,609.00 | 69,609.00 | 419,218.00 |
| | **National Interest Test Statement**<br>Many leading and critical Australian organisations – banks, the Australian Defence Force, primary industry, health care – utilise thousands of networked devices able to sense and communicate with each other (the Internet of Things – IoT). This complex IoT network provides organisations with connectivity with great power and speed but is complex for non-experts to understand and is also an avenue by which they may be attacked – each device is a potential cyber vulnerability providing a backdoor into the organisation and its data for cyber criminals. This project delivers a risk identification framework that employs artificial intelligence techniques (cognitive security – utilising multiple unstructured data sources) to rapidly identify, prioritise, and explain vulnerabilities in any organisation's IoT network. This allows managers of those organisations and assets to understand the threats they face and to act to best secure their sensitive data and protect their organisation from attacks through hardening their IoT network. | | | | | |

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|---|---|---|---|---|---|---|
| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| DE230100163 | **Overcoming the Intrinsic Instability of Perovskites Materials and Devices** | 69,230.00 | 141,560.00 | 144,160.00 | 71,830.00 | 426,780.00 |
| Zhang, Dr Meng | This project aims to improve the intrinsic stability of metal halide perovskite energy materials for advanced optoelectronic applications. The key concept is to suppress the phase-segregation for alloyed perovskite by interstitial management as well as develop low-temperature crystallization for non-alloyed perovskite through rational design of the intermediate phase evolution, which has the potential to generate new knowledge in addressing the key challenge on the operational stability of perovskite devices. The outcomes are expected to deliver valuable intellectual property to accelerate the commercialization of perovskite technology, enabling low-cost utilization of solar energy for a sustainable and low carbon-emission economy. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | To further lower the cost of solar panels requires the development of new materials and devices. This project aims to improve the intrinsic ‘stability’ of the most promising low-cost light absorption material, so called 'metal halide perovskite', by preventing it from undergoing structural and compositional changes that typically occur during long-term use. The intended outcome of the project will contribute to a substantial cost-reduction for solar energy conversion, improving further the economics of solar power by promoting the commercialisation of perovskite solar cells and will play a vital role in reducing carbon emissions both in Australia and globally. The intellectual property created from this project will be licensed to companies involved in manufacturing of new generation of solar panels. With current global concerns regarding energy high prices and the criticality of supply chains, this project would also assist in developing the capability of establishing manufacture of low-cost and reliable solar panels in Australia. | | | | | |
| DE230100178 | **Fast, lightweight and live nanopore sequencing analysis** | 74,338.50 | 149,401.00 | 152,618.00 | 77,555.50 | 453,913.00 |
| Gamaarachchi, Dr Hasindu M | This project aims to address limitations in nanopore sequencing (latest emerging technology in genomics) by applying advanced computational methods. This project expects to create new knowledge in bioinformatics and computer science through innovative approaches that leverage the live data streaming capability of nanopore devices to deliver results rapidly, or in real-time. Expected outcomes include improved, highly efficient analysis methods and designs for future creation of custom computer hardware for nanopore analysis. This will facilitate widespread adoption of nanopore technology in bioscience research and applied domains (health, agriculture, ecology, biosecurity and forensics), including for portable in-the-field applications. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Genome sequencing and analysis – the process of reading and analysing the blueprint of life - has countless present and future applications in agriculture, industry, medicine, forensics, ecology and biosecurity. The latest sequencing technology called ‘nanopore’ offers portable devices that can perform this sequencing at a much-reduced cost and time compared to previous technologies. Unfortunately, these portable devices produce large amounts of complex data which require massive and expensive supercomputers to analyse, negating the benefit of these portable nanopore sequencers. This project will create advanced, yet efficient computational methods and purpose-built custom computer hardware to enable the processing of this data on a portable handheld computer. The outcome of this project will enable widespread adoption of these low-cost and portable sequencing devices throughout Australia, for instance, breeding better crops and livestock at farms, accurate diagnostics and personalised therapies at rural clinics and rapidly detecting biosecurity threats at the border. | | | | | |
| DE230100180 | **Multifunctional Biomass Coatings for Electrostatic Induced Fire Hazards** | 71,459.00 | 144,568.00 | 146,818.00 | 73,709.00 | 436,554.00 |
| Wang, Dr Wei | This project aims to solve the problem of fire hazards caused by static electricity in hazardous industrial areas by synthesizing feasible, environmentally friendly, and efficient multifunctional biomass-based coatings. This research expects to study the fire-safe biomass coating using interdisciplinary approaches and establish a comprehensive understanding to provide new strategies and solutions to tackle fire safety issues occurring in hazardous industries and other relevant applications. This research and development of high value-added high-tech multifunctional biomass coating is targeted to boost the Australian local coating industry and bring about important economic and societal benefits. | | | | | |

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

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Fire hazards associated with the build-up of static electricity in hazardous industrial areas are a major problem, especially due to Australia's relatively dry climate. This project aims to develop eco-friendly fire-proof materials as coatings to protect structures against fires in industries such as mining, oil and gas, manufacturing, military, and the emerging hydrogen energy sector. This technology will advance novel and scalable application of fire-retardant coatings with better efficiency and lower cost. The outcomes include development of an environmental-friendly sprayable coating with high multifunctional features of fire retardancy and anti-static. This research will enable Australian companies, such as the industry partners that the applicant has been collaborating with in the ARC Training Centre for Flame Retardant and Fire Safety Technology, to manufacture, deploy, and export a new generation of fire-retardant coatings for a wide range of industries, therefore contributing to economic and environmental benefits for Australia. | | | | | |
| DE230100271<br>Berry, Dr Scott D | **Coordinating gene expression and cell size: the role of feedback regulation**<br>This project aims to reveal how human cells coordinate the kinetics of messenger RNA (mRNA) transcript production, processing and degradation at the single-cell level. It expects to generate significant new biological knowledge of gene regulation by combining innovative interdisciplinary research methodologies in genetics, single-molecule imaging, mathematical modelling and quantitative cell biology. Expected outcomes include enhanced training of researchers and to build Australia's capability in the rapidly expanding fields of RNA biology and high-throughput microscopy. This should provide significant benefits for a myriad of applications including health, agriculture and veterinary sciences. | 77,017.00 | 155,164.00 | 154,792.00 | 76,645.00 | 463,618.00 |
| | **National Interest Test Statement**<br>Each of the trillion cells in the human body carries the same DNA genome, an instruction manual for the entire body. But each cell only 'reads' a portion of this manual depending on its function, interpreting the DNA message via a related molecule, called RNA. How each cell 'knows' which DNA section to covert to RNA message is unknown. This project aims to understand how cells regulate this process, uncovering new insights into how and where RNA molecules form and how they function, thereby filling key knowledge gaps in the fundamental biology of every living cell. The work will help to inform key Australian technologies working at the frontiers of RNA technology: from how to make new RNA vaccines; imaging RNA molecules for future medical, agricultural, or veterinary diagnostics; to drug screening that uses RNA to look at how cells respond to different drugs, their response interpreted via an RNA barcode. With RNA tech in ascendancy, outcomes from the work will undoubtedly boost Australia's future biotechnology industry and other fields of critical economic, health, and commercial impact. | | | | | |
| DE230100315<br>Maher, Dr Nicola | **How will Pacific climate variability impact Australia in a warming world?**<br>Temperature variability in the Pacific Ocean is characterised by El Niño and La Niña (year-to-year variations) and the Interdecadal Pacific Oscillation (decadal variations). These phenomena are primary drivers of Australian temperature and rainfall. Leveraging new tools and methods, including Single Model Initial-Condition Large Ensembles, this project will investigate drivers of these phenomena, and their impacts on Australia in a warming world. Outcomes include the quantification of how these climate phenomena modulate extreme weather events, and an understanding of how Indian and Atlantic Ocean warming affects the Pacific region. This will improve the prediction of extreme events, which is critical for preparation for their impacts. | 77,308.00 | 150,758.00 | 147,713.00 | 74,263.00 | 450,042.00 |
| | **National Interest Test Statement**<br>Extreme events (e.g. bushfires, droughts and floods) cost Australia $18.2 billion per year on average and have major societal impacts (e.g loss of homes, health and agriculture impacts). Such extreme events are strongly influenced by temperature variability in the tropical Pacific Ocean that manifests as the climate phenomena El Niño and La Niña (year-to-year timescales) and the Interdecadal Pacific Oscillation (20-30 year timescales). This project aims to better understand what drives these phenomena and their subsequent impacts on Australia under present and future climate scenarios. This objective aligns directly with the Australian Government Priority Area on improved accuracy and precision in predicting and measuring the impact of environmental changes. Outcomes from this project will improve seasonal predictions of extreme events facilitating more informed decisions for risk management and adaptation from seasonal to multi-decadal timescales. Ultimately this assists the Australian community in preparing for changing impacts in a warming world. | | | | | |

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| DE230100382 | **Charge and Energy Transfer Processes at Inorganic-Organic Interfaces** | 75,359.00 | 149,968.00 | 149,218.00 | 74,609.00 | 449,154.00 |
| Nielsen, Dr Michael P | The integration of functional molecular materials with inorganic systems remains an outstanding hurdle to achieve durable, highly efficient optoelectronic devices. This project aims to develop and understand this new class of devices, with a focus on directional energy transfer processes across hybrid interfaces. This project expects to generate new knowledge in photovoltaics (PV) and for organic light emitting diodes (OLEDs) by studying triplet transfer in two model systems. The first will be a step towards the development of advanced PV devices using down-conversion to push solar cells beyond the efficiency barrier. The second will demonstrate inorganic-organic solid state up-conversion for next generation OLEDs with improved stability. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project focuses on two classes of devices used in the everyday lives of Australians: solar cells and organic light emitting diodes (OLEDs). To improve energy efficiency and longevity of use, this project aims to create a new class of hybrid electronic devices that combine the light emission/absorption advantages of molecular materials with the standard semiconductors used in everyday electronics. It will focus on how these two materials interact to optimise energy transfer between them and will utilise the ability of molecular materials to shift the colour of light. For solar cells, this will increase the fundamental efficiency limit to > 40% (conventional cells are limited to < 30%) without significantly changing current manufacturing processes, supporting Australia's clean energy transition. For OLEDs, this will lead to longer-lived displays and less device failure. It is expected that valuable intellectual property and technological leadership will arise from this project that will be licensed to industry partners for large scale manufacturing. | | | | | |
| DE230100637 | **An integrated electrolyser for CO2 conversion from capture media.** | 71,109.00 | 142,718.00 | 142,968.00 | 71,359.00 | 428,154.00 |
| Li, Dr Mengran | This project aims to develop an efficient electrochemical method to convert carbon dioxide (CO2) to valuable chemicals. It expects to displace the energy-costly step of its upstream CO2 capture process. The key novelty is the use of flow-through electrodes and optimal solvents to promote CO2 conversion at high rates. Expected outcomes include enhanced efficiency of CO2 sequestration, and new techniques to develop electrodes with well-controlled local reaction environments, which are essential for electrochemical energy conversion and storage. This will benefit Australia's environment and industries such as cement and aluminium manufacturing in managing carbon emissions, and accelerate Australia's transition to a carbon-neutral economy. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will develop technology to capture carbon dioxide and convert it to useful, value-added materials using electrochemistry employing novel electrodes. The technology will recover carbon dioxide from the air, thereby offsetting the carbon footprint of important industries while generating valuable chemicals such as formic acid, carbon monoxide, ethylene, and ethanol. The global market for products such as these is worth hundreds of billion dollars per year. The project has the potential to lower the energy cost of the carbon capture process by 44%. This technology will not only accelerate Australia's transition to a carbon-neutral economy but will also generate valuable export income as intellectual property and chemical feedstocks. The findings will also advance expertise in carbon dioxide capture and conversion technologies, which are important to support future policy making. Commercial realisation of the potential outcomes of this project will involve partnering with Australian companies or generating a local spin-out company. | | | | | |
| DE230100642 | **Outbreak science: a social study of wastewater evidence, viruses and drugs** | 78,666.50 | 155,897.00 | 150,880.50 | 73,650.00 | 459,094.00 |
| Lancaster, A/Prof Kari | This project aims to develop new understandings of how evidence is made, and how 'evidence-enough' is translated for policy, in situations of urgency and uncertainty. Outbreak science indicates how evidence-making might be done differently to improve responses. By innovatively drawing on sociological approaches, this project expects to advance the theory and practice of outbreak science, and examine critically its potential, through a timely study of one emerging technology of outbreak science, wastewater analysis, tracing its use in illicit drugs policy and infection control of viruses. Expected benefits include optimising how evidence is used for policy in situations of novel event, emergency and uncertainty, enabling better responses. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Scholars at the forefront of the COVID-19 response have said that scientists, policy makers, and citizens need to move on from imagining that uncertainties can be resolved – they may never be. To move on we need new ways of thinking about evidence for policy in emergencies. Outbreak science proposes a way to improve emergency response, and wastewater analysis is seen as a promising tool in the context of drug policy and infection control. To harness emerging approaches like wastewater analysis, we need to understand how outbreak science does its work. Specifically, we need to understand how a threshold of 'evidence-enough' for action is managed, and how uncertainty is negotiated, so that evidence can be useful for policy decisions. This project moves outbreak science into innovative terrain, with potential to change how evidence-making and decision-making is done in emergencies. The project contributes to the Australian Government's Science and Research Priority Health and its Practical Research Challenge of improved prediction, identification, prevention and management of emerging threats. | | | | | |
| DE230100684<br>Mason, Dr Alexander F | **Building a synthetic chemical synapse through harnessed stochasticity**<br>At the molecular level, biology is noisy, and life has evolved a plethora of mechanisms to harness this noise for useful output. If we want to construct de novo living systems to learn more about biology and the origin of life, then we must not ignore noise. This project aims to apply a design philosophy that embraces randomness to construct an artificial chemical synapse. Expected outcomes include creating a blueprint for the next generation of more dynamic artificial cells, developing vital tools for the elucidation of principles in biophysics and systems biology, and deepening our understanding of how noisy molecular level events have downstream effects on macro-scale behaviours. Several international collaborations are involved. | 70,609.00 | 143,718.00 | 146,218.00 | 73,109.00 | 433,654.00 |
| | **National Interest Test Statement**<br>Synthetic biology seeks to redesign organisms for useful purposes by artificially 'engineering' them to have new abilities, and is already changing the way we grow food, treat disease, and manufacture new materials. This project will develop a highly innovative and novel approach to engineer cells that exhibit useful properties, such as the ability to identify and adapt to changes in environmental conditions. Many living systems have this capability, and it underlies many adaptive biological processes, such as evolution. The ability to harness this adaptive capability in synthetic cell systems will contribute to the rapidly growing global market for synthetic biology, has the potential to transform biomanufacturing, particularly in areas such as agriculture, food and chemical synthesis. That growth is estimated to increase from US$5.3B in 2019 to US$18.9B in 2024. The outcomes of this project will establish Australian intellectual property, a proportion of which is expected to be protected by patenting, that can be licensed for agribusiness, diagnostics, and drug discovery. | | | | | |
| DE230100789<br>Lovell, Dr Emma C | **Photo-thermal ammonia decomposition**<br>This project aims to develop of novel catalysts targeted to utilise light and heat for the photo-thermal decomposition of ammonia to produce hydrogen and generate new understanding on the role of light in thermal catalytic reactions. The emergence of the hydrogen economy has resulted in the urgent need for safe and efficient hydrogen transport and storage vectors. Ammonia, a hydrogen carrier, is being increasingly considered as a potential key to facilitate the hydrogen economy due to its relative ease of storage. The development of catalysts tailored toward capturing light for ammonia decomposition will enable a new potential pathway for the hydrogen economy, with ammonia as a hydrogen vector. | 71,500.50 | 135,153.50 | 127,306.00 | 63,653.00 | 397,613.00 |
| | **National Interest Test Statement**<br>There is an urgent need to transition from our current approach to energy generation, storage, and transport. The use of hydrogen as a zero-emission fuel is contingent on a safe and efficient approach to its storage and distribution. Ammonia, produced via renewable energy, provides a promising solution to this challenge as it can act as an effective 'hydrogen carrier'. This project will design novel materials that will exploit light and heat from the sun to generate hydrogen from ammonia. This project will contribute to Australia's transition to be a global leader in hydrogen-based renewable energy generation through the development of a more energy efficient pathway to produce hydrogen, on-site and on-demand, and the provision of a safe and effective route to transport energy within Australia and internationally. It is expected that valuable intellectual property and technological leadership will arise from this project which will be licensed to industry partners for large scale manufacturing. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| DE230101281 | **An Efficient Computational Solver for Complex Engineering Problems** | 54,053.00 | 108,106.00 | 110,586.00 | 56,533.00 | 329,278.00 |
| Ahrari, Dr Ali | This project aims to address significant gaps in the existing knowledge about solving complex engineering problems that involve conflicting objectives and unquantifiable features. In these problems, the decision-maker is interested in knowing high-quality and dissimilar solutions that determine the trade-off between the problem objectives. The intended outcomes of this project include a novel robust computational solver that can automatically find such solutions. The decision-makers can then choose the final solution based on their expertise and preferences. This expects to offer significant benefits to diverse engineering disciplines by finding superior and more practical solutions to their complex multidisciplinary problems. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Finding the best solutions to complex engineering problems can substantially reduce the production cost and increase the reliability of the generated products and services. However, these solutions are hard to find since these problems often involve specific challenges, such as conflicting objectives and unquantifiable features. This project intends to develop a robust computational solver that can automatically find a diverse set of top-quality and different solutions to these problems. The decision-makers can then choose the most suitable solution based on their experience and preferences. The accomplishment of this project provides a significant contribution to advancing knowledge on robust computational solvers for complex multidisciplinary engineering problems. Such computational solvers will improve existing capabilities in diverse industries such as mining, manufacturing, energy generation and distribution by providing superior and distinct solutions for the decision-makers, resulting in more affordable, accessible, and reliable products and services for the public. | | | | | |
| DE230101391 | **Intelligent Physical Layer Security Protocols for Backscattering in IoT** | 70,553.00 | 142,106.00 | 142,506.00 | 70,953.00 | 426,118.00 |
| Mishra, Dr Deepak | This project aims to develop novel theories, system models, and energy-efficient optimisation algorithms to fight against eavesdropping and jamming attacks in backscatter communication networks. This project expects to advance knowledge in cybersecurity and sustainable communications by utilising passive tags for several confidential applications like human tracking and financial distributed systems. Expected outcomes include vital technologies required in practically realising the ubiquitous deployment of low-cost sustainable wireless devices in Internet-of-Things. This should significantly benefit the Australian industry, society and economy regarding reduced energy costs, enhanced spectrum efficiency, and improved communication security. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will develop new software that advances low-cost and energy-efficient secure wireless communications. It uses a breakthrough in Internet-of-Things (IoT) technology, i.e. networks of physical objects with sensors and processing ability, that solves the problem of how two wirelessly connected devices can communicate via existing radio signals without requiring any energy from the devices themselves. Examples of IoT devices include smart lights, security cameras, and smart temperature controllers. The project outcomes can be adopted by existing Australian companies or new startup companies to pioneer new high-tech IoT devices that will make low-energy, cyber-secure products, support the manufacturing and services sectors, and create new high-value jobs. It will also pave the way for a new era of batteryless IoT devices, significantly reducing hazardous battery waste for the environment. The outcomes of this project will promote a new type of commerce called IoT-Commerce, which for example allows customers to track their purchases continuously all the way from placing the order to final delivery. | | | | | |
| DE230101396 | **Designing Single-atom catalysts for Renewable Waste Conversion to Urea** | 59,053.00 | 118,506.00 | 121,056.00 | 61,603.00 | 360,218.00 |
| Daiyan, Dr Rahman | This DECRA aims to realise the direct electrochemical conversion of waste resources using renewable energy to generate urea at ambient conditions. By designing impurity-tolerant single atom catalysts and unearthing their structure-activity relationships, the utilisation of flue gas and wastewater will be materialised. This will advance our understanding in the field as current energy conversion reactions require pure feedstocks. Expected outcomes from the program is envisioned to lead to deployment of scalable decentralised modes of green urea production (substituting imports), and the knowledge transferrable to other areas of Australia's emerging hydrogen economy, extending the scope of renewable Power-to-X to realise a circular economy. | | | | | |

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| | **National Interest Test Statement**<br>Urea is an important chemical for agriculture and transport. However, there is currently a critical shortage of urea in the country, that is affecting both the agriculture sector where urea is used as fertiliser and in the mining industry where the chemical is used to reduce emissions (AdBlue). This project aims to develop a production system that will convert waste resources (including carbon dioxide and wastewater) into urea using renewable energy, enabling a circular economy. By developing this one-step pathway, this research aims to address the current urea shortage in a reliable and sustainable way. The project will engage with industry partners to trial this technology in regional sites. Critical to Australia's interest, large-scale deployment of this technology in regional locations will lead to reduction in carbon dioxide emissions from the country's agriculture industry (a major contributor to Australia's greenhouse gas emissions) by minimising requirement for transportation to farms and avoiding the need for high-emission conventional fossil-fuel based urea production. | | | | | |
| DE230101591<br>Gong, Dr Dong | **Towards Real-world Continual Learning on Unrestricted Task Steams**<br>This project aims to enable machines to continually learn without forgetting and accumulate knowledge from the sequential data streams containing diverse tasks. This project expects to advance the continual learning to unrestricted real-world task steams that are long-term and complex and promote artificial intelligence toward the human-level intelligence that can automatically evolve during interaction with the world. Expected outcomes of this project include the paradigm-shifting continual learning framework and techniques for handling unrestricted task steams in real-world scenarios. They will benefit society and the economy nationally and internationally by enhancing the applicability of artificial intelligence. | 69,859.00 | 139,718.00 | 139,718.00 | 69,859.00 | 419,154.00 |
| | **National Interest Test Statement**<br>Machine learning (ML) is a form of artificial intelligence that enables machines to make predictions from data and adapt to new scenarios. It underpins a spectrum of systems from speech recognition to medical diagnosis. The current approaches to ML are data-intensive; a model is trained based on (often manually) labelled data - new data emerge frequently, and collecting an ideal dataset is difficult. This project will address these issues by advancing 'continual learning' technologies, making ML systems continually evolve to perform complex real-world tasks with a less data-intensive initial setup. The successes of the project will place Australia at the forefront in this emerging research direction worldwide. The enhanced continual learning ability in ML systems will deliver significant commercial and social benefits for Australian industry, effected through the licensing of IP. These include robust autonomous transport systems to quickly identify and learn about unforeseen safety issues, medical diagnosing to timely update the disease knowledge, advanced manufacturing, and other ML-based sectors. | | | | | |
| DE230101617<br>Esrafilzadeh, Dr Dorna | **Re-engineering metallic-based nanostructures for carbon dioxide conversion**<br>This project aims to fine-tune the interface of low-temperature liquid metals to produce functional hybrid nanomaterials for CO2 reduction. The expected outcomes of the projects are to develop fundamental knowledge on the integration of functional molecules on the bulk, core, and skin of liquid metals and their alloys. It intends to control the atomic arrangement of the elemental constituents, nucleation, as well as interaction and dissolution of organic/inorganic molecules in the interface and bulk of liquid metals. The anticipated outcomes of this project are to define a knowledge roadmap to exploit the untapped potentials of liquid metals in CO2 reduction, which would enable the production of the next generation of catalytic devices. | 72,123.00 | 142,982.50 | 145,074.50 | 74,215.00 | 434,395.00 |
| | **National Interest Test Statement**<br>Carbon dioxide capture and conversion into stable products that can be used or stored is a key strategy for reducing its impact on the environment. Liquid metals are an exciting new technology, opening up innovative approaches to reducing these greenhouse gas emissions. However, there are still huge challenges in processing liquid metals at the very small scales needed for such innovation. This project will develop and apply new manufacturing techniques that can overcome these challenges. The innovative processes developed will enhance the capacity of Australian industry to more efficiently recycle carbon dioxide and will ultimately contribute to achieving National greenhouse gas emission commitments. This discovery research will develop and protect intellectual property on new liquid metal processing that will build Australia's research capability in this area and, through licencing to Australian industry partners, will underpin more efficient industrial processes with lower production of pollutants. | | | | | |

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| DE230101711 | **Printed Infrared Quantum Dot Photodetectors and Large-scale Image Sensors** | 75,359.00 | 150,718.00 | 150,718.00 | 75,359.00 | 452,154.00 |
| Hu, Dr Long | Detectors operating in shortwave infrared region are critical in civil and military applications. This project aims to demonstrate revolutionary low-cost and high performing shorwave infrared lead sulfide quantum dot photodetectors and large-scale image sensors with compatible structures for the potential applications on complementary metal–oxide–semiconductor readout integrated circuits through fully printing. Expected outcomes of this project included the new understandings of surface passivation, interfacial engineering and device design. The shortwave technologies developed in this project will be highly prospective for commercialization in the near future, which would bring Australia's shortwave technologies to a new stage. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Devices than can detect wavelengths of light beyond the red-end of the visible spectrum are critical in civil (e.g., detecting forest fire) and military (e.g., security monitoring) applications. Traditionally they are made from costly thin layers of semiconductors. This project aims to deliver low-cost and high-performing nanoparticle-based detectors and printed large device arrays for infrared camera imaging. The proposed nanoparticle printing technology will be fully compatible with potential applications on standard, silicon-based microchips , reducing the cost of low-noise, high-accuracy imaging. The outcome addresses the gap in low-cost infrared-light sensors, and the developed technology and licensed IP are expected to have a high potential for spin-offs with a short lead time to market. This project will allow Australia to contribute to a highly promising area in line with the ambition to bring more semiconductor manufacturing into the country. | | | | | |
| | **The University of New South Wales** | 1,280,955.50 | 2,557,760.00 | 2,558,677.00 | 1,281,872.50 | 7,679,265.00 |

## The University of Newcastle

| | | | | | | |
|---|---|---|---|---|---|---|
| DE230100401 | **Deconstructing the brain circuits of reward-seeking** | 72,281.00 | 134,834.50 | 124,670.50 | 62,117.00 | 393,903.00 |
| Campbell, Dr Erin J | This project aims to deconstruct the brain circuits that shape reward-seeking behaviour in different environments. The anticipated significance of this project is to provide mechanistic insights into why we choose to seek rewards in safe, but not dangerous environments. Expected outcomes include answering fundamental questions about how the environment shapes our behaviour by identifying projection cell subtypes important for reward-seeking, characterising their neuronal activity and precisely defining their molecular phenotype. The benefits of this project are expected to provide a new knowledge base for understanding decision-making in a constantly changing world. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Every day we make choices (decisions) that are influenced by our external environment. A safe environment generally promotes rational decision-making whereas a threatening environment may promote irrational decision-making, with irreparable consequences. This project will use leading-edge molecular technology to understand how our brain circuitry controls reward-seeking behaviour across different environments. This will enhance our understanding of decisions made under pressure, providing a tool to, for example, improve national responses during critical emergency situations (health outbreaks, defence threats), bringing major industry, environmental and societal benefits. More broadly, understanding how decisions are made at a molecular level will provide new insights that could be used by many other industries. For example, the food and beverage sector, a national priority under the Australian Government's Modern Manufacturing Strategy, could develop new food additives that target those molecular mechanisms to increase consumption of healthier products, leading to health, economic and commercial benefits. | | | | | |
| | **The University of Newcastle** | 72,281.00 | 134,834.50 | 124,670.50 | 62,117.00 | 393,903.00 |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **The University of Sydney** | | | | | | |
| DE230100016 | **Wireless Communications for Human-Machine Collaboration** | 75,619.00 | 146,234.00 | 140,667.00 | 70,052.00 | 432,572.00 |
| Liu, Dr Wanchun | Industry 5.0 is a new industry transformation vision where the focus lies on the interaction between humans and machines. Wireless human-machine collaboration (HMC) will play a central role in a wide range of industrial applications in Industry 5.0. This project aims to develop new fundamental theories of wireless HMC and enable novel wireless communications designs to accommodate the stringent and dynamic requirements of HMC with performance guarantees. The project will provide innovative solutions to advanced manufacturing, remote healthcare, mining, and warehousing and will benefit Australia's digital transformation. | | | | | |
| | **National Interest Test Statement**<br>Human-machine collaboration (HMC) is an emerging research direction involving humans and machines working collaboratively to perform complex tasks. Communication networks connecting humans and machines are a key enabler of HMC. However, the existing communication networks cannot meet the stringent HMC requirements for transmission delay and reliability to keep people safe in hazardous situations, for example in mining and manufacturing. This project will develop a fundamental framework for new HMC wireless communication systems with very high reliability and very low transmission delay. For example, the technology will allow mining workers to stay away from hazardous environments by remotely controlling robots and vehicles. The fundamental discoveries and demonstrators developed in this project can be translated to new commercial products and services, such as advanced manufacturing (which uses innovative technologies to improve products and processes), remote surgery, energy grids, and mining, resulting in increased safety, sustainability, productivity, and quality of life for Australians. | | | | | |
| DE230100087 | **Illuminating the function and evolution of iridescence** | 75,205.50 | 142,930.50 | 130,578.00 | 62,853.00 | 411,567.00 |
| White, Dr Thomas E | This project seeks to reveal how dynamic colour signals enable effective communication by connecting the production, transmission, and perception of visual information through space and time. By integrating innovative analyses of behaviour, physiology, and optics, it will offer original insight into how information is encoded and fluidly exchanged under real-world conditions, and produce new tools for interrogating the subjective visual world of animals. This work promises benefits to our understanding of how the universal process of communication drives adaptation amidst environmental change, with significant scope for bio-inspired solutions to contemporary problems of vision and efficient information processing, including among humans. | | | | | |
| | **National Interest Test Statement**<br>Interpreting visual information is key for most animals' survival. Whether identifying flowers and fruits by colour, or signalling to other animals using motion, we have only a basic understanding of how visual cues are used to guide their behaviour. This project will use Australia's unique native flies and rich beach habitats to examine how colour and motion interact to communicate information, and how animals use this information to make decisions such as who to mate with or when to flee from predators. The project will lead to improved ways of understanding visual processing, enabling new solutions to problems of vision and efficient information processing, including among humans, inspired from nature. Example solutions include new models of how colour, brightness, and motion information is combined in the brain, and an improved ability to predict how changes in visual conditions drive changes in animal behaviour. These outputs can result in new approaches for computer processing and video display design that may be used by our high-tech industries, including more colour-accurate computer displays and more sensitive cameras. The key benefit to this research is fundamental knowledge of how vision works in complex, real-world conditions. In applied terms, this work will benefit conservation efforts in Australia by improving our ability to predict how animals adapt to ongoing environmental change. By collaborating with conservation organisations and industry, this will allow us to better conserve Australia's endangered species, minimise the negative impacts of human activity on ecosystems, and improve the welfare and wellbeing of our food-production livestock. | | | | | |
| DE230100206 | **Pain: Open to interpretation?** | 70,859.00 | 141,718.00 | 140,718.00 | 69,859.00 | 423,154.00 |
| Todd, Dr Jemma L | This project aims to determine how pain interpretation drives pain experience, using rigorous state-of-the-art lab research. This project expects to generate new knowledge about the psychological mechanisms maintaining pain experience and avoidance behaviour, using novel techniques to measure interpretation of pain sensations. Expected outcomes include the development of an evidence-based psychological model of pain interpretation, enhanced capacity to build international collaborations, and ecologically valid methods for measuring pain interpretation. This research forms a solid platform for further translational research, to build novel, scalable interventions to improve outcomes for the one in five Australians living with chronic pain. | | | | | |

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| | **National Interest Test Statement**<br>A staggering one in five Australians live with chronic pain, costing $139 billion annually in healthcare, loss of productivity, and mental health impacts. It is a global health priority, and despite medical advancements we still don't understand why some people develop chronic pain. There is growing recognition of the important (but often neglected) psychological mechanisms that contribute to pain experience. This project harnesses the latest technology to look at the thinking processes and behaviours that make pain worse, creating an evidence-based model that will inform future research and clinical practice. This important experimental research will form the foundation for novel, scalable internet-delivered interventions that can alleviate suffering and reduce opioid use for the 3+ million Australians with chronic pain. | | | | | |
| DE230100387<br>Kramer, Dr Elisabeth A | **The Politics of Tobacco Policy in Indonesia**<br>This project aims to investigate the difficulty of regulating tobacco products in Indonesia by interrogating the influence of domestic politics, the global tobacco industry and the role of interest-based lobbying. To probe the political context that has fostered this situation, it combines multiple streams theory and a policy networks approach. Expected outcomes include a detailed political history of tobacco-related policy, mapping of stakeholder influence on policy, and a conceptual model explaining connections between policy creation and stakeholder networks. Project benefits include a tested analytical approach that can be used to explore policy environments for the regulation of harmful, but licit, industries, in a range of contexts. | 72,910.50 | 143,641.00 | 128,866.00 | 58,135.50 | 403,553.00 |
| | **National Interest Test Statement**<br>This project will develop new insights into the political and social barriers to effectively regulating tobacco products. Using Indonesia as a case study, the research will analyse the relationship between policy creation and networks of stakeholders, including lobbyists. This will facilitate the development of policy settings aimed at reducing the health risks posed by tobacco consumption in low- and middle-income countries where smoking remains prevalent. The research will benefit Australia through the economic and social advantages of maintaining healthy populations among key trading partners. It aligns with Australia's commitment to the United Nations' Sustainable Development Goals, and position as a leader promoting good governance, health and well-being in the region. The project's findings and the analytical model developed can also be applied to the regulation of other harmful, but legal, substances and industries. This will also benefit Australia by contributing to domestic policy discussions around managing the health risks of, and effectively regulating, potentially harmful but licit industries. | | | | | |
| DE230100469<br>Mould, Dr Stephen J | **Re-igniting 'artistic vibrancy' in the Australian opera ecosystem**<br>This project aims to advance new methodologies for re-establishing 'artistic vibrancy' (a factor found to be lacking by the National Opera Review in 2014-16) within operatic practice in Australia. The project expects to generate new knowledge of vital, but hidden musical processes, using interdisciplinary approaches in order to rebalance and recalibrate the opera ecosystem. Expected outcomes include the revitalisation of operatic practice and the establishment of clear parameters for responsible opera curation. Benefits include an enhanced awareness of artistic vibrancy within opera, and the creation of new practices, which will be of significant cultural and artistic benefit to the wider Australian community. | 78,160.50 | 150,554.50 | 143,003.00 | 70,609.00 | 442,327.00 |
| | **National Interest Test Statement**<br>Opera plays a significant role in Australia's cultural and social life, as shown by the positioning of the Sydney Opera House on the harbour foreshore, and its deliberately emblematic status. In 2016, a crisis in the industry was signalled by the findings of the National Opera Review (NOR), which ruled that 'artistic vibrancy' has been in decline over the past few decades. However, the NOR predominantly considered economic, commercial, and access issues, instead of the deeper processes of curation (selecting, organising and presenting performances) which drive and generate opera. This project investigates the vital role behind-the-scenes musical specialists play in fostering artistic vibrancy, to provide the industry with valuable perspectives on the inner workings of opera creation. Building on the NOR, it will give publicly funded operatic institutions impetus to reconsider and recalibrate operational practices and priorities and establish Australia as a world leader in operatic practice. The project has the potential to embed opera more deeply within the Australian psyche and create substantial cultural and societal benefits for the Australian community. | | | | | |

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| DE230100557 | **The Behavioural Economics of Inheritance Litigation** | 76,803.00 | 153,901.00 | 146,137.00 | 69,039.00 | 445,880.00 |
| Chen, Dr Ben | Australians are witnessing the greatest intergenerational wealth transfer in history. Unfortunately, more and more families are going to court over inheritance. These disputes tear families apart and impose excessive costs on families and the courts. This project applies legal, behavioural economic and statistical methods to study inheritance battles. It seeks to generate new knowledge about the drivers of inheritance litigation, in order to make it cost-effective. Its expected outcomes include behavioural economic models of inheritance litigation to predict what cost-reduction strategies will work; a large database of real-world inheritance cases to test these predictions; and robust law-reform recommendations to reduce litigation costs. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australians inherited over $120 billion in 2018 and this figure is projected to grow fourfold by 2050. Court battles over inheritance have also increased, nearly tripling in NSW since 2005, and imposing high costs on families and courts. Existing measures to control costs reduce them for some litigants but increase them for others. This project uses behavioural economic models to give new insights into how to reduce the costs of inheritance litigation, providing rigorous evidence to law-reformers and policymakers. Its law-reform and policy recommendations will help save money for countless Australian families in inheritance disputes. Reduced litigation costs will make the Australian justice system fairer and more accessible, especially to those victims of inheritance misconduct who currently cannot afford to obtain a remedy from court. It will provide guidance to help reduce the costs of inheritance cases to Australian courts, enabling them to operate more effectively and efficiently. The new models created may also be applicable to other types of litigation, including divorce, separation and child custody. | | | | | |
| DE230100634 | **Phos-Ligation: A powerful new tool for chemoselective protein modification** | 68,608.00 | 136,711.00 | 136,462.00 | 68,359.00 | 410,140.00 |
| Corcilius, Dr Leo | The project aims to develop a powerful new method for the generation of pure modified proteins. Tools for modification of proteins are integral to the study of protein structure and function as well as the commercial production of biopharmaceuticals. The extremely cost effective and operationally simple chemistry that will be developed in this project will overcome a number of pitfalls of currently available methods for protein modification, and will therefore deliver substantial technological innovation to both academia and industry. Through domestic and international collaboration, this new technology will be applied to study proteins involved in the defence of wheat against fungal rust disease and in inflammatory signalling in humans. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will deliver an efficient and cost-effective chemical process to make highly valuable protein molecules that are widely used across the agricultural and pharmaceutical sectors. As part of the project, this novel technology will be applied to investigate the molecular mechanism of how wheat defends itself against infection from a type of wheat rust, a fungal disease which could cost the cereal industry several billion dollars in lost crop production if it were to arrive in Australia. The knowledge generated from this project will contribute towards the protection of one of Australia's chief exports and, through engagement with industry and rural development corporations, can be adopted by our agricultural sector to develop disease resistant varieties of wheat. This new chemical process also has the potential to provide an improved method for manufacturing high value protein molecules for the biotechnology and pharmaceutical industry. Therefore, a second goal of this project is to use this new process to prepare a range of precisely tailored bioactive protein molecules that will inform the cheaper and more efficient production of next generation diagnostics and treatments for human disease in Australia, for example, fluorescent proteins for diagnostic medicine, immune therapies, and customised antibodies for cancer chemotherapy. | | | | | |
| DE230100837 | **Modulating protein phase behavior: cell functions vs material development** | 75,359.00 | 148,018.00 | 145,368.00 | 72,709.00 | 441,454.00 |
| Shen, Dr Yi | It has been recognized recently that cellular proteins can undergo liquid-liquid phase separation, however, a further liquid-to-solid transition can lead to aberrant biological processes. This project aims to investigate and control this behaviour to gain insights into cell dysfunction and new routes for biomaterials development. An integrated approach combining microfluidic platforms, optical techniques, and vibrational spectroscopy will be exploited. Expected outcomes of this project include the mechanistic understanding of protein phase behaviour and protein-based biomaterial engineering. This should provide significant benefits in the prevention of aberrant protein aggregation and the generation of materials as plastic substitutes. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Many natural proteins possess extraordinary properties. For example, spider web fibres made by silk proteins are considered one of the strongest materials. This project will develop tools capable of monitoring and modifying the way proteins interact with themselves and other molecules, and enable the development of new materials, such as biodegradable plastics made from proteins. This research can provide a solution to the global problem of single-use plastic waste, 10 million tonnes of which is dumped into our oceans each year. Advancing this technology in Australia will enable Australian industries to access a new generation of biodegradable plastics that are both cost-effective and sustainable to manufacture. Partnerships will be sought with biotechnology companies and the food, cosmetic and personal-care industries, which can implement the technology to increase their competitiveness, and decrease their packaging costs and environmental impact. Its widespread adoption will contribute to providing all Australians with cleaner, healthier oceans to enjoy. | | | | | |
| DE230101047<br>Peterie, Dr Michelle | **Child Wellbeing in the Context of Parental Detention**<br>This project will investigate the consequences of parental detention for children living in the Australian community. It will use qualitative sociological methods to document and theorise children's experiences of a parent's detention, with a focus on the factors that shape children's social, emotional and material wellbeing in these situations. Expected outcomes include new knowledge concerning the lives and welfare of these potentially vulnerable children, as well as evidence-based insights regarding the social supports they need to thrive. The project will deliver internationally relevant recommendations to help policymakers and service providers improve the lives of children and families navigating the incarceration of a parent. | 77,546.00 | 153,597.00 | 152,075.00 | 76,024.00 | 459,242.00 |
| | **National Interest Test Statement**<br>In 2016, the Australian government released most children from immigration detention facilities, markedly improving their wellbeing in the process. This project seeks to further improve outcomes for children in Australia by examining the challenges faced by minors with a parent in detention. The project will provide detailed evidence and practical recommendations to help safeguard these children's welfare. It will thus contribute to Australia's Science and Research Priority of 'Health', which seeks to improve outcomes for disadvantaged communities. It will also help Australia to meet its international obligations under the Convention on the Rights of the Child, which affirms that children have the right to remain with their parents and requires that children separated from their parents receive special support. Key project findings will be disseminated to policymakers and service providers, and incorporated into the Australian Human Rights Commission's 2024 report to the United Nations on the rights of children in Australia. | | | | | |
| DE230101128<br>Chi, Dr Shaopeng | **Decode Neuro-Mechanobiology:mechanosensitive ion channels in proprioception**<br>Human bodies are densely covered with numerous mechanosensory neurons that provide us with the sense of touch and pain. However, the molecular force sensors remain poorly identified. This project aims at defining the fundamental roles of mechanosensitive ion channels to sense and respond to various mechanical stimuli, and how their responses may encode mechanical cues.The ultimate goal is to provide a fundamentally new understanding of proprioception and motion sensing. The new multimodality approach generated in this project is expected to evolve as a national facility for neuro-mechanobiology, and future research may lead to the inspiration of novel bionic sensor design and brain-computer interface for future neuroengineering industry. | 73,359.00 | 147,718.00 | 148,718.00 | 74,359.00 | 444,154.00 |
| | **National Interest Test Statement**<br>The ability to sense the environment is essential for survival in all organisms. In humans, for example, sensation arises from the surface of the body or internal organs and provides us with the sense of pain. These are vital functions allowing living things to continuously adapt to changes in their external and internal environment. This project aims to explain the molecular basis for our ability to sense pain. It will develop new methods to explore how bodily sensation enables us to feel and interact with the physical world, and provide crucial links between external stimuli — such as sensation received from the skin — and the electrical signals that drive nervous-system responses. The research employs a novel imaging system with capabilities that can deliver new insights into how animals perceive motion. This work will inform many areas, from neuroscience to how electronics industries develop novel sensor designs and brain-computer interfaces to improve devices which replace damaged senses, such as motor implants that restore motor functions in stroke patients. | | | | | |

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| DE230101136 | **Understanding Philosophical Progress** | 61,631.00 | 136,840.00 | 152,577.00 | 77,368.00 | 428,416.00 |
| Norton, Dr James P | This project aims to develop the first unified account of progress in science and philosophy, by extending the noetic account of scientific progress into an account of philosophical progress. According to this account, progress consists in increased understanding, i.e., in grasping how something depends on, or fails to depend on, something else. Developing a unified account will shed light on the nature of intellectual progress quite generally, as well substantially advancing meta-philosophical debates about (i) the prevalence of philosophical progress; (ii) whether, and the ways in which, expert disagreement would undermine progress; and (iii) which philosophical methodologies promote progress. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Philosophers study some of the biggest ethical and political problems affecting our societies – from how individuals think about their role in the environment, to issues of free speech, race, disability, and gender. But how can we ensure that we are making progress in addressing these challenges? This project will develop a new way of understanding philosophical progress, similar to how we think about progress in science, whereby understanding is gained by improving on previous discoveries and theories. This new way of thinking about progress will provide the necessary tools for philosophers to assess whether we are making ground in resolving ethical and political questions. This will benefit the community by ensuring that important questions, such as those concerning equality, are being answered to improve social and cultural wellbeing. It will create a framework that can be applied to guide the allocation of private and public resources to maximise progress and deliver economic benefits to Australia. | | | | | |
| DE230101159 | **Climate Change: The Role of Reporting, Auditing and Executive Remuneration** | 76,407.50 | 148,784.50 | 140,736.00 | 68,359.00 | 434,287.00 |
| Zhou, Dr Shan | This project addresses the need for corporate disclosures on climate-related risks. It aims to generate new knowledge about reporting and auditing of climate-related information and how these metrics are incorporated into executives' remuneration. Utilizing the latest global developments, the project will highlight best practices under both voluntary and mandatory reporting regimes and provide cross-jurisdictional evidence on the impact of mandatory reporting schemes. It will also test the effectiveness of reporting, auditing and remuneration in achieving carbon emissions reductions and meeting capital market demands. The project will lead to improved capital market efficiency and informed policy making in Australia and internationally. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australian investors struggle to direct funds to climate-sustainable businesses because corporate disclosures about climate risks are not reliable. Current climate-related reporting is voluntary, not integrated with audited financial reports, unstandardised and hard to compare, and thus is unsuitable for setting executive incentives. Urgently needed progress towards emission control depends on the development and adoption of rigorous climate-related disclosure standards for corporations. Some countries are adopting mandatory disclosure rules and international accounting bodies are promoting auditable standards. This project will collect and analyse international and Australian corporate data to compare performance in countries that mandate climate-related disclosures with those that do not and measure the effectiveness of integration and auditing practices. The fit-for-purpose, enforceable climate-related reporting standards that this research will produce will benefit Australians by enabling efficient emission control and climate change adaptation. New insights into effective disclosure from this research can be adopted into accounting standards to reshape corporate practice. | | | | | |
| DE230101223 | **Using metacognitive self-evaluation to improve knowledge transfer** | 58,053.00 | 113,106.00 | 110,106.00 | 55,053.00 | 336,318.00 |
| Double, Dr Kit S | The knowledge and skills developed in the classroom often do not transfer to the workplace or even to other subjects at school. This project aims to evaluate how the transfer of knowledge can be enhanced by prompting students to evaluate and reflect on their performance in specific ways. The project will identify how different students respond to self-evaluation and how self-evaluation can most effectively be designed and applied in the classroom. Newly developed self-evaluation prompts will be implemented in a computerised and adaptive way so that self-evaluation is tailored to a particular student. This project should provide a scalable and cost-effective way to help students apply what they learn in a more flexible and efficient way. | | | | | |

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| | **National Interest Test Statement**<br>This project has the potential to have considerable educational and economic benefits. Australians increasingly have to apply our prior knowledge and skills to new environments and problems e.g., when we change jobs or go from university to the workforce. Yet, we often fail to flexibly apply what we know in these novel contexts. This is economically inefficient and affects both achievement at school and the ability of future generations to innovate solutions to national and global problems. The current project develops and evaluates new ways of using self-evaluation to help learners transfer what they know to new contexts and problems. Self-evaluation is a scalable and cost-effective solution to this problem because it does not require additional resources or information (e.g, from a teacher) and can be used independently. As a result, this project has the potential to improve the efficiency of precious educational resources, while helping Australia develop a more flexible and adaptable workforce. | | | | | |
| DE230101226<br>Butler, Dr Orpheus M | **Plant community responses to fire regime: the role of plant–soil feedbacks**<br>We need to know how different prescribed burning regimes set the stage for long-term changes in plant community composition, diversity, and flammability. This project aims to reveal how plant community dynamics under different fire scenarios can be predicted based on contemporary interactions between plants and soil micro-organisms. This innovative approach to fire ecology integrates soil biology and plant ecophysiology with sophisticated experiments and novel modelling techniques. Expected outcomes include a much-needed mechanistic framework for early detection of major ecological changes under novel fire regimes, with direct benefits for land managers and the long-term conservation of Australia’s iconic vegetation. | 75,000.00 | 150,000.00 | 150,000.00 | 75,000.00 | 450,000.00 |
| | **National Interest Test Statement**<br>Prescribed burning is one of the main approaches to wildfire risk reduction in Australia. The wrong prescribed burning regime could lead to losses of plant diversity and enhanced plant community flammability over the long-term, but we have limited ability to predict such consequences. As such, we have no way of knowing whether current or future prescribed burning practices will ultimately prove counterproductive. A clear solution to this problem lies in the intense interactions between plants and soil micro-organisms that ultimately drive long-term plant community dynamics. This project will use knowledge of these interactions to build a novel framework for predicting long-term responses of Australian plant communities to various prescribed fire scenarios. Project findings will have application in the design of ecologically sustainable fire regimes that effectively mitigate wildfire risk over the long-term, thus benefitting land and fire managers and supporting the conservation of Australia’s rich and unique natural heritage. | | | | | |
| DE230101236<br>Liu, Dr Xuyu | **Chimeric molecules for precision protein modification**<br>This project aims to address fundamental questions on how natural modifications of proteins cause functional changes inside cells. The project expects to generate new knowledge in the areas of organic chemistry and chemical biology through the development of a synthetic platform for the discovery of a novel class of chimeric molecules that can trigger precise modifications of proteins. Expected outcomes include a detailed understanding of how specific modifications modulate protein and cellular function. Significant benefits of this interdisciplinary project include access to a new class of molecules for basic research that may also find use for cell engineering applications within the growing biotechnology sector in Australia. | 74,859.00 | 148,718.00 | 147,218.00 | 73,359.00 | 444,154.00 |
| | **National Interest Test Statement**<br>Cells acquire important functions beyond the limits of their genome through chemical modification of proteins. Understanding the chemistry and biology of these modifications is critical for elucidating the mechanisms underpinning fundamental physiological processes. This project aims to develop new molecular tools to trigger protein modifications on-demand and study the resulting impacts on cell function and behaviour. Outcomes of the proposed research have the potential to contribute to the well-being of Australians through generating abundant knowledge on how protein modifications influence cell decision-making. The technology platforms developed from this project will provide significant benefits to Australia's manufacturing industry in the biotechnology sector, fuelling economic growth through low-cost manufacture of advanced biotechnology products with a vast market value ($65 billion by 2026). This cutting-edge research will provide world-class training for Australia’s next generation of scientists with multidisciplinary skills and elevate them to the forefront of chemical and biological research. | | | | | |

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| DE230101262 | **Art, Migration, State-Building: India in the Indian Ocean World** | 76,053.00 | 152,606.00 | 153,106.00 | 76,553.00 | 458,318.00 |
| Firouzeh, Dr Peyvand | This project aims to investigate the historical movement of objects, knowledge, and people across cultures in the Indian Ocean world, countering the Eurocentric framework of previous scholarship by adopting a trans-Asian network lens. Focusing on art and architecture in fifteenth-century central India, it examines how an independent, largely Muslim state comprised of migrants fashioned itself through works of art that challenged cultural and geographical boundaries. This project expects to advance new methodologies for studying hybrid visual cultures, generate new knowledge about the dynamics of global connectedness in the early modern era, and deepen our understanding of the mechanics of migration and cultural exchange today. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will deliver a unique history of multicultural understanding through art and architecture of fifteenth-century India. It will analyse tombs, paintings, textiles, and public infrastructure (like water wells) to show how societies have used art to develop global connections, integrate migrant communities, address conflict, and promote religious diversity. New publicly accessible educational resources and cultural events will provide social and cultural benefits to Australia by showing how art can advance acceptance of cultural diversity. A key product of the project will be a website allowing individual Australians and teachers to explore the Bidar Tomb (India) through interactive digital media, and to see the role that public monuments played in building states and societies. Collaborative programs with the Art Gallery of NSW and migrant artists in Australia, will create a forum for the public to learn about the unique history of South Asia and Australia's South Asian communities, and how multicultural societies like Australia can use art to debate important social issues such as migration, diversity, and inclusion. | | | | | |
| DE230101329 | **Trading Privacy, Bandwidth and Accuracy in Algorithmic Machine Learning** | 69,859.00 | 142,268.50 | 146,318.50 | 73,909.00 | 432,355.00 |
| Canonne, Dr Clément L | This project aims to investigate the trade-offs between privacy, communication costs and accuracy of results when learning from users' sensitive data. The project intends to design faster and more accurate algorithms for a wide range of machine learning tasks by developing a novel and widely-applicable algorithmic framework. Expected outcomes of this project include new theoretical tools to guide the design of data-driven decision systems and rigorously analyse their performance and privacy guarantees. Privacy of individuals' information in data analytics pipelines is a key societal concern. This project should lead to significant benefits by strengthening privacy in these pipelines while also improving accuracy and cost-efficiency. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Data analytics applications have been immensely successful in enabling faster and more accurate decision-making in areas as diverse as health, business, education and policy. For example, our ability to constantly analyse individuals' evolving health data, mobility patterns, and test results was key to Australia's response to the COVID-19 pandemic. Protecting the privacy of our personal information in systems that undertake these analyses is a key societal concern. This project aims to design faster and more accurate algorithms for a wide range of machine learning tasks by developing a novel and widely-applicable algorithmic framework. Expected outcomes include new theoretical tools to guide the design of systems that use and analyse data and to rigorously assess their performance and privacy guarantees. Improved privacy-preserving data analysis tools will ensure Australians' personal data is protected, even against malicious attackers. More broadly, the tools and techniques developed in this project will also improve the accuracy and cost-efficiency of these systems, leading to significant economic benefits for Australia. | | | | | |
| DE230101422 | **Co-creating critical health literacy interventions** | 78,783.00 | 157,566.00 | 154,783.00 | 76,000.00 | 467,132.00 |
| Muscat, Dr Danielle M | This project aims to enhance critical health literacy in culturally and linguistically diverse communities in western Sydney. Never in history has there been such an abundance of health information from numerous sources, with varying degrees of trustworthiness. This project intends to work with communities to co-create scalable interventions which promote critical health literacy and support people to navigate and appraise the sea of available health (mis)information. This project expects to provide significant social and health benefits through the development of innovative health literacy research methods for use with culturally-diverse communities and scalable interventions with the capacity to enhance critical skills across communities. | | | | | |

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| | **National Interest Test Statement**<br>60% of the Australian population (~15.4 million people) have low health literacy, but there remain few health literacy interventions particularly for culturally and linguistically diverse communities who are disproportionately impacted. Improving health literacy is a national priority as evidenced by the 2020-2025 National Health Reform Agreement's focus on "empowering people through health literacy" and 2021 Parliamentary Inquiry into adult literacy and its importance. This project will deliver a suite of health literacy interventions co-created with culturally and linguistically diverse communities. It will enhance critical health literacy (e.g. skills to critically appraise online information) and develop novel mechanisms to support distribution and amplification through social networks. Through its focus on culturally and linguistically diverse groups who are too often excluded from research, this project has the potential to reduce existing health literacy disparities. | | | | | |
| DE230101536<br>Cater, Dr Rosemary J | **How does heme regulate blood vessel formation in the brain?**<br>There are more than 600 kilometres of blood vessels in the brain, all of which are lined by tightly packed cells that protect the brain from toxins. My research aims to investigate how these blood vessels are formed. This project expects to reveal the role that a critical signalling molecule called heme plays in this fundamental biological process. I will use cutting-edge structural biology and biophysical techniques to uncover the molecular mechanisms that allow heme to enter cells and regulate blood vessel growth in the brain. The outcomes of this research will enhance our understanding of the brain's core infrastructure and will contribute to an understanding of how cerebral blood vessels grow and maintain integrity. | 78,909.00 | 157,918.00 | 158,003.00 | 78,994.00 | 473,824.00 |
| | **National Interest Test Statement**<br>Blood vessels in the brain supply the brain with nutrients and protect it from toxins. This research investigates how brain blood vessels are formed to understand normal and abnormal vessel function. It will discover how important molecules from blood regulate the formation and growth of brain blood vessels. This will facilitate research on how brain blood vessel formation is associated with compromised vessel integrity, for example in stroke, where vessels become blocked or ruptured causing severe tissue damage. Also, because many drugs do not easily pass across brain blood vessels into the brain, the results will also contribute to research on improving drug delivery across vessel walls into the brain. Given that brain disorders account for over 20% of the total burden of disease in Australia with an economic burden of over $74 billion per year, this will result in significant economic benefits for Australia. | | | | | |
| DE230101551<br>Abimbola, Dr Folarin Oluseye (Seye) | **Towards dignity-based knowledge practices in global health**<br>When the dignity of its beneficiaries is not respected, especially their dignity as knowers, global health efforts in low-income settings perpetuate falsehoods and promote wrong interventions. This project aims to fill an urgent gap in the field of global health – how to institutionalise respect for beneficiaries' dignity as knowers. The project will do so by investigating strategies that helped to institutionalise evidence-based practices in the fields of health care and health policy. Expected outcomes include practical strategies to institutionalise dignity-based practices in knowledge production, use and circulation. This should lead to major social, health and economic benefits by improving the effectiveness of global health efforts. | 69,109.00 | 143,990.00 | 152,762.00 | 77,881.00 | 443,742.00 |
| | **National Interest Test Statement**<br>Ensuring that Australia's foreign and local health spending reduces health disparities requires working with disadvantaged groups in ways that respect their dignity as people with intimate knowledge about their problems and how to solve them. This research will develop strategies to entrench such dignity-based practices – whereby decisions about the health of disadvantaged groups are not made in isolation from them, and research on their health is conducted with their full ownership. These strategies will ensure, for example, that people from disadvantaged groups are included and empowered to participate in decision making rather than assuming practitioners know what they want, and that they are aware of tools that are available to assist with understanding scenarios they are experiencing. The project will work with key stakeholders (including researchers, practitioners, funders, activists and the World Health Organization) to develop and disseminate these new practices – and new rules to ensure that researchers and practitioners implement them – resulting in improved health outcomes and reduced health disparities. To achieve this, the research will study the wide success of a similar initiative that successfully entrenched new practices (on how to generate and use rigorous evidence) in health care and policy decision-making in Australia and elsewhere, using new rules including ethics requirements and decision aids. | | | | | |

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| DE230101652 | **Assessing climate risk for future food supply** | 72,339.00 | 143,318.00 | 144,863.00 | 73,884.00 | 434,404.00 |
| Malik, Dr Arunima | The aim of this project is to assess the impacts of future disruptive climate events and disasters on Australia's food system. This will be achieved by developing a world-first Integrated Assessment Modelling Lab, a collaborative research platform for comprehensive assessment of the effects of extreme climate events (bushfires/drought/floods/cyclones) on Australia's food supply. The project will use this capability to assess impacts on Australia's national and international supply chains, industry sectors and on socio-economic groups. The outcomes will offer opportunities to improve national responses to the changing climate and build resilience by designing adaptation plans to safeguard national and international food supply chains. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Assessing the impacts of natural disasters, such as bushfires, cyclones, droughts and floods, on Australia's food supply is complex and challenging. This project will create an Integrated Assessment Modelling Lab that is able to comprehensively assess how extreme climate events can impact Australia's food and industry sectors. The Lab is a collaborative research platform that will bring together the range of experts and data to address this complex problem. The Lab will provide information and analysis to Australian policy-makers in order to secure food production as our climate changes, and to help improve how we respond to extreme events. The deep understanding of Australia's interconnected systems, including national and international food supply chains, provided by this project will help in implementing strategies to safeguard our economy from future environmental change. This research will contribute to Australia’s economic growth by building healthy and resilient rural and urban communities adapting to a changing climate. | | | | | |
| DE230101683 | **Computational Design of Defect-Free Additive Manufactured Ceramic Structure** | 76,459.00 | 151,368.00 | 147,718.00 | 72,809.00 | 448,354.00 |
| Zhang, Dr Zhongpu | Despite its importance and potential, ceramic additive manufacturing (AM) is facing significant challenge for its inherent material characteristics prone to shrinkage and fracture during fabrication process. This project aims to fill a knowledge gap by developing a new computational design framework for a commonly-used indirect AM process. It will address a range of AM issues, such as residual stress/distortion, cracks, and uncertainty in a nondeterministic context. The study is expected to establish novel design methodologies for ceramic AM with process modelling, robust/reliable optimisation, and fracture-based design. It will provide ceramic industry with a new framework for biomedical, aerospace and mechanical applications. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Ceramics are gradually replacing traditional engineering materials in aerospace, biomedical, and defence industries. Their exceptional properties can produce stronger and better performing engine parts, orthopaedic implants, spacecraft, body armour and scaffolds for tissue engineering. As ceramics cannot be cast or machined easily, the industry has turned to additive manufacturing (industrial-grade 3D printing) to provide the flexibility needed to efficiently fabricate sophisticated and customisable ceramic structures. This project will develop new computer modelling and optimisation methods for manufacturing robust and reliable ceramic structures and overcome a series of critical issues currently associated with 3D printing, such as residual stresses, distortions and cracks. The results will deliver fundamental insights into the effects of structural design on the durability and lifetime of manufactured ceramic components which could be used to make orthopaedic implants and other biomedical products more durable. The new design methodologies and computational tools this project develops will enhance Australia’s technological share in the future ceramic additive manufacturing industry creating economic benefits for Australia. | | | | | |
| | **The University of Sydney** | 1,611,891.00 | 3,211,506.00 | 3,170,782.50 | 1,571,167.50 | 9,565,347.00 |
| **University of Technology Sydney** | | | | | | |
| DE230100065 | **Navigating Uncertainty & Evidence: Teaching for Epistemic Cognition** | 71,599.50 | 143,199.00 | 138,019.00 | 66,419.50 | 419,237.00 |
| Knight, Dr Simon | We are facing an epistemological crisis, grounded in changing technologies, fake news, and a distrust of experts. Developing capability to navigate uncertainty, disagreement, and evidence is one of the most pressing social issues of our time in order to develop a sustainable society, ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all. Despite relevant research, little is known about the crucial practices of educators in supporting learning towards these capabilities. This project will bring classroom practice and a practical theory of epistemic cognition into synchrony, developing new knowledge and strategies for students to learn how to navigate uncertainty, disagreement, and evidence. | | | | | |

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| | **National Interest Test Statement**<br>This project aims to understand how secondary school teachers equip learners to comprehend, integrate and evaluate complex information (epistemic cognition). There are domestic and international calls to lift the quality of teaching in order to positively influence student outcomes. Data suggests most high school graduates are ill-prepared to comprehend, integrate and evaluate information from complex texts. Their poor epistemic cognition can negatively impact their ability to participate in the workforce and make sustainable personal and civic decisions. With expert teachers, this project will co-design and evaluate a sophisticated toolkit of professional development resources for teachers to eventually implement in the classroom to enhance learners' epistemic cognition. The new methodologies developed will better align classroom practice with established learning sciences research. By contributing to inclusive and equitable quality education and promotes lifelong learning opportunities, the project will deliver sustainable benefits to Australian schools, learners and society. | | | | | |
| DE230100079<br>Lin, Dr Gungun | **Anisotropic single-particle transducers**<br>The project aims to tackle a major challenge in techniques that manipulate tiny particles – increasing the performance of transducer devices that convert magnetic forces to mechanical movement. It will centre on interactions on the surface of particular particles, bypassing a known scientific limit. Expected outcomes include a fundamental understanding of key factors that have recently been shown to enhance magnetic responsivity and efficient mechanical manipulation and sensing in a magnetic field. The project outcomes will benefit developers by, for example, advanced nanoscale devices for robotics, sensing and molecular bioassays; controlling biophysical processes; and fundamental mechanobiology research. | 66,053.00 | 137,906.00 | 139,906.00 | 68,053.00 | 411,918.00 |
| | **National Interest Test Statement**<br>When studying diseases at the molecular level, biomedical researchers rely on special materials that respond to mechanical pressure, but existing materials are not suitable to concurrently screen large numbers of diseased cells. The project will address this gap by creating new nanotechnology materials for the efficient conversion of magnetism into mechanical action, which will create new techniques to understand how mechanical pressure contributes to diseases that will lead to effective therapeutic strategies. It will not only enable Australian biotechnology companies and instrumentation manufacturers to develop robotic technology at microscopic scale, but will eventually lead to life-saving medical procedures. The project outcomes will support interdisciplinary collaboration between cell biologists and roboticists, allowing research translation into high-tech start-ups and the creation of an advanced manufacturing industry: biomedical robotic devices. The new nanomaterials will therefore ultimately contribute to economic and health benefits for the Australian public. | | | | | |
| DE230100141<br>Sommer, Dr Brigitte | **Anticipating ecological shifts in subtropical marine ecosystems**<br>This project aims to unravel the causes of abrupt ecological change in the subtropics and predict their future in warming seas. Uniting large-scale field observation and modelling in a novel multi-species framework, this project seeks to quantify how warming and species interactions combine to escalate change on subtropical reefs at different stages of tropicalisation. Expected outcomes include new insights into the factors that promote stability or change along subtropical coasts in Australia and Japan, where the influx of tropical species already has dramatic consequences. By comparing dynamics in Australia with tropicalisation hotspots in Japan, this project expects to anticipate future ecological shifts and benefit strategic management. | 75,369.00 | 152,442.00 | 146,781.00 | 69,708.00 | 444,300.00 |
| | **National Interest Test Statement**<br>Australia's subtropical and temperate marine ecosystems sustain unique biodiversity and ecosystem services. They contribute >$10 billion annually to Australia's economy and support the livelihoods and culture of Australia's most populated regions. Yet, they are experiencing record change as tropical species move to cooler regions in warming seas. By studying subtropical reefs at different stages of tropicalisation in Australia and Japan, this project will create critical knowledge for sustaining the biodiversity and ecological functioning of these systems. Japan's subtropical reefs are tropicalisation hotspots where shifts in habitat forming species have led to fisheries collapse. They provide a lens into the potential future of Australia's subtropical reefs. Comparing ecological dynamics in Australia and Japan will therefore build Australia's capacity to anticipate and mitigate future change. This project will provide more accurate predictions of climate change impacts, squarely addressing National Science and Research Priorities and some of the greatest challenges for natural resource management today. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| DE230100477 | **Advancing Human Perception: Countering Evolving Malicious Fake Visual Data** | 68,359.00 | 139,568.00 | 142,418.00 | 71,209.00 | 421,554.00 |
| Yu, Dr Xin | The aim of this project is to provide new effective and generalisable deepfake detection methods for automatically detecting maliciously manipulated visual data generated by misused artificial intelligence (AI) techniques. It will present innovative computer vision and image processing knowledge and techniques, enabling the developed methods to advance human perception in recognising fake data, enhance cybersecurity, and protect privacy in AI applications. The anticipated outcomes should provide significant benefits to a wide range of applications, such as providing timely alerts to the media, government organisations, and the industry about misleading fake visual data, and preventing financial crimes on synthetic identity fraud. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The aim of this project is to produce accurate and explainable deepfake detection algorithms that not only detect forged visual data effectively but also localise the forgery parts, thus protecting decision makers and the public from misinformation. The expected outcomes will provide commercial, economic and social benefits to a wide range of sectors, such as security, forensics, media, and the economy. For instance, the developed methods will be able to identify fake news containing malevolently manipulated images or videos of a public figure. This would benefit the cybersecurity sector (by detecting fabricated visual data accurately) and social media (through improvements of data examination). It is anticipated that the project will advance deepfake detection systems to address various deceitful images/videos in due course, considering fabricating fashions evolve invariably to pursue indistinguishable visual effects. This project will enable individuals and the government to access authentic visual data, protect government and media credibility, and improve the safety and stability of the community. | | | | | |
| DE230100495 | **Structured Federated Learning for Personalised Intelligence on Devices** | 70,359.00 | 140,718.00 | 140,718.00 | 70,359.00 | 422,154.00 |
| Jiang, Dr Jing | The project aims to develop a new structured federated machine-learning framework to enhance the customisation of artificial intelligence across mobile and smart devices. It seeks to enable users to receive customised services on their devices without sending their sensitive personal data to a cloud service provider. Anticipated benefits include greater privacy, data security and device performance, as well as better end-user experience. Expected outcomes of this research include new knowledge, toolkits and algorithms for use in developing machine-learning based secure, efficient and fault-tolerant technologies for software applications, mobile services, cloud computing, autonomous vehicles and advanced manufacturing processes. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | According to the Consumer Policy Research Centre (Dec 2020), 94% of Australian consumers are uncomfortable with how their personal information is collected and shared online. This project will provide solutions which stop the need for sharing our private data to cloud service providers, while still enabling us to receive the same quality of personalised service. In a new marketplace of artificial intelligence (AI) -empowered service, each end-user can have a customised intelligent model on personal smart devices. The expected outcome of this project, a new collaborative machine learning framework, can simultaneously assist millions of clients, e.g., smartphone users, to generate personalised intelligent models without sharing users' private data. As well as securing Australia's future share in these AI-service markets and protecting Australians to be less vulnerable to the negative consequences of privacy leakage, the personalised intelligence approach generated by this project will help deliver improved quality-of-service, model performance on devices and user experience. | | | | | |
| DE230100693 | **Emergence: Examining gender equity in music via a new contemporary opera** | 76,805.50 | 152,758.50 | 151,869.50 | 75,916.50 | 457,350.00 |
| Wilcox, Dr Felicity J | This DECRA will investigate one of Australia's significant art-forms: opera. Led by an established Australian composer, it aims to develop new technologies and methods for composition and collaboration. The expected outcomes include new analysis of contemporary, international operatic practice and an original Australian opera that focuses on gender equity in music as its subject, translating data on this topic into creative-practice. The DECRA's significance is to create new, more inclusive frameworks for opera that centre women and gender-diverse music creators and can extend to other musical genres. Benefits include the investigation of urgent issues arising now in Australian workplaces and amplification of the voices of the marginalised. | | | | | |

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| | **National Interest Test Statement**<br>This project will advance creative practice by investigating the under-representation of female/gender-diverse composers, challenging prevailing operatic narratives that present gendered stereotypes, and deploying new technologies creatively. The key outcome will be an original, Australian opera that integrates digital technology to include diverse participants in the compositional process. Accessible tools (smart-phones, sensors, pulse-rate monitors) will be adapted for performers and spectators to contribute text/music to the work in real-time. The project will drive social and cultural change by prioritising inclusion and applying affordable technologies to reimagine opera. Renewing the ways opera is created and delivered is a key recommendation of a recent national opera review. Benefits extend to other artforms and to Australian arts organisations seeking sustainability through increased audience diversity and engagement, equitable practices, and cost-effective design. Strong community and music industry links will result in outcomes that benefit a diverse society, in Australia and internationally. | | | | | |
| DE230101025<br>Kendig, Dr Michael D | **Food for thought: identifying dietary influences on decision making**<br>Cues that signal food are abundant in the surrounding environment, yet their ability to stimulate food consumption remains poorly understood. This project seeks to identify how food cues influence decision-making processes in the presence of food cues. It will also test how dietary habits alter responding to food cues, and explore the underlying neural mechanisms of these effects. Sophisticated behavioural neuroscience techniques will be employed in a validated rodent model of the modern diet. Expected outcomes include new interdisciplinary knowledge identifying how nutritional choices influence cognition and the brain. The project should inform how the modern environment shapes dietary habits. | 76,500.00 | 151,500.00 | 151,553.00 | 76,553.00 | 456,106.00 |
| | **National Interest Test Statement**<br>The composition of the Australian diet has changed dramatically, with consumption of high-fat, high-sugar foods now routine in all demographic groups. Choosing to eat such foods can be prompted by cues in the surrounding environment, such as passing a fast-food sign or entering a food court. There is an urgent need to understand precisely how these cues alter decision making processes related to food seeking and consumption, and whether sensitivity to food cues is altered by dietary habits. This project will address this knowledge gap using experiments which model real-world scenarios of food cue exposure, enabling us to identify the brain regions involved in cue-driven overeating. Outcomes will enhance understanding of modern eating habits by identifying how the surrounding environment influences food choices. The knowledge gained may inform advertising and health care policy approaches that seek to address maladaptive eating habits and the associated economic and health burden. | | | | | |
| DE230101127<br>Nguyen, Dr Thanh T | **Stabilising soil foundation with biopolymer for enhanced rail transport**<br>This project aims to develop a novel cost-effective and eco-friendly method to stabilise soil foundation for faster and heavier rail transport. The scientific knowledge of cyclic behaviour capturing localised and microscale evolutions of railway foundation will be advanced significantly via innovative physical modelling using iconic facilities with state-of-the-art sensors, and sophisticated numerical modelling. The project will yield a natural biopolymer-based solution for mud pumping railways, i.e., a critical issue causing substantial annual maintenance cost and poor transport efficiency in Australia and worldwide. The outcomes will greatly benefit transport infrastructure, mining, agriculture, environment and climate change remediation. | 76,580.00 | 149,049.00 | 145,010.50 | 72,541.50 | 443,181.00 |
| | **National Interest Test Statement**<br>Unstable track foundations are a significant issue for rail transport worldwide, especially in Australia where heavy trains often run through coastal regions affected by persistent rain. Millions of Dollars are spent annually on railway maintenance, yet track fouling and instability frequently cause transport disruptions and delays across the country. This project will significantly improve our understanding of the mechanisms causing track degradation. It will also develop a novel eco-friendly solution to stabilise affected foundations using natural materials made from agricultural byproducts instead of the fossil-based materials currently in use, such as plastics and cement. Adoption of this solution by the railway industry will lead to novel design and maintenance methods, improved transport efficiency and extended track longevity, along with significant savings on maintenance costs. Expected outcomes will not only bring considerable socio-economic benefits to Australia, especially to the mining and agriculture industries through enhanced rail transport, but will also contribute to greener technologies. | | | | | |
| | **University of Technology Sydney** | 581,625.00 | 1,167,140.50 | 1,156,275.00 | 570,759.50 | 3,475,800.00 |

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| **University of Wollongong** | | | | | | |
| DE230100001 | **Regulations in Privacy-Preserving Blockchain Systems** | 68,359.00 | 138,803.00 | 143,673.00 | 73,229.00 | 424,064.00 |
| Li, Dr Yannan | This project aims to develop an integrated regulatory paradigm for privacy-preserving blockchain. This project expects to reduce cybercrimes and illegal transactions in blockchain and provide solutions for the regulation concerns raised in the national blockchain roadmap, using interdisciplinary approaches and new primitives. Expected outcomes of this project include providing versatile regulation services covering the whole lifetime of transactions while maintaining transaction privacy and user anonymity. This should provide significant benefits to the economy by reducing the financial loss caused by blockchain abuse worldwide ($76 billion per year) and promoting Australia's blockchain ecosystem (grow to AU$68.4 billion by 2030). | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Blockchain put simply is a system in which a record of transactions, such as bitcoin or another cryptocurrency, is maintained across several computers. This project will provide technological solutions to empower blockchain regulation that reduces cybercrime due to blockchain abuse, which causes a global financial loss of $76 billion per year. In doing so it will address the need to balance privacy and enforcement of regulation in digital transactions. The expected outcome of this project is to provide a more secure and regulation-friendly blockchain with versatile regulation services, covering the whole lifecycle of a transaction. Specifically, it is to deter malicious users from blockchain abuse with regulation policies, to trace the identity of malicious users and to rectify polluted transactions, while still preserving privacy for honest users in the system. This research will directly benefit Australia by providing algorithmic solutions to blockchain regulation, a key concern in the National Blockchain Roadmap released by the Australian government. The outcomes of this project will demonstrate feasibility of these new technologies, to be translated in collaboration with other researchers and the national regulator. | | | | | |
| DE230100069 | **Integrating food and nutrition into fisheries and aquaculture management** | 67,018.50 | 138,666.50 | 145,637.50 | 73,989.50 | 425,312.00 |
| Farmery, Dr Anna K | The project aims to provide knowledge to improve food systems, in line with the UN Sustainable Development Goals, through fisheries and aquaculture. Food and health outcomes are not well-integrated into fisheries and aquaculture policy or management, despite global expectations that aquatic foods will help address current and anticipated food system challenges. Expected outcomes include new knowledge on implementing food- and nutrition-based management objectives in fisheries and aquaculture, and methods to measure benefits in different national contexts. Outcomes should increase capability to manage fisheries and aquaculture to improve human health through diets while achieving environmental, economic and other socially positive outcomes. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The research contributes to Australia's national interest through new knowledge on fisheries and aquaculture management with the potential to improve public health outcomes. Non-communicable diseases are a leading cause of death and disability in Australia, in particular for Indigenous Australians, and poor diets are the major contributor. Aquatic foods can play an important role in the prevention of non-communicable diseases, such as cardiovascular disease. This research will contribute insights into improving public health through the management of aquatic foods, while simultaneously targeting environmental and economic benefits. Academia, government and the private sector will be engaged in activities to embed food- and nutrition-based objectives into fisheries and aquaculture sectors and to monitor outcomes, including contributions to UN Sustainable Development Goal 2 - Zero Hunger. The research will also contribute to cross-cultural understandings that improve knowledge exchange between Indigenous Australians and fisheries and aquaculture management. | | | | | |
| DE230100695 | **Circular capabilities for living with obdurate waste** | 74,609.50 | 146,512.00 | 150,058.00 | 78,155.50 | 449,335.00 |
| Stanes, Dr Elyse R | The circular economy is being promoted to resolve the looming materials crises created by excessive consumption. But circularity is still out of reach for much of the economy. The DECRA project aims to address critical questions of how to manage obdurate wastes that exceed circular economy models. Through an innovative critical social science approach, the project expects to advance knowledge on two stubbornly obdurate wastes – refrigerants and plastic textiles, their latent capacities for circularity, and the policy framings required to achieve change. Expected outcomes include enhancing Australia's capacity in developing more circular economies, and integrating these into the next generation of industry and environmental policies. | | | | | |

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|---|---|---|---|---|---|---|
| | | 2022-23 | 2023-24 | 2024-25 | 2025-26* | |
| (Columns 1 and 2) | (Column 3) | (Column 4) | (Column 5) | (Column 6) | (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Each year, 90 billion tonnes of materials are used globally to sustain industry and contemporary lifestyles. Some 90% become waste. The circular economy promotes reuse and recycling to minimise waste, and aids new green industries. Hindering progress is that many materials required to feed, clothe, house and transport people and things are unseen, toxic, or difficult to locate, separate or repurpose. This project will trace two such materials—plastic textiles and air-conditioning refrigerants—that add to global environmental problems. New methods integrating in-depth interviews, data mapping, and policy analyses will reveal where these materials go and where they end up, and the governance structures, skills and expertise needed to handle and reuse them. Policymakers, industry stakeholders and communities will benefit from these outcomes: knowledge to better manage difficult waste streams; improved resource reuse; and opportunities for new green industries and jobs. Collaboration with industry networks will enable knowledge transfer and uptake, positioning Australia to lead the world in circular initiatives. | | | | | |
| | **University of Wollongong** | 209,987.00 | 423,981.50 | 439,368.50 | 225,374.00 | 1,298,711.00 |
| **Western Sydney University** | | | | | | |
| DE230100380<br>Grootswagers, Dr Tijl | **The dynamics of object representations in the human brain**<br>The human brain's ability to effortlessly recognise and categorise objects enables effective behavioural responses in complex everyday environments. Despite the apparent efficiency of this process, it is still unknown how the brain solves object recognition. This project capitalises on cutting-edge advances in artificial intelligence and neuroscience to resolve the spatiotemporal dynamics of object processing in the human brain. The outcomes will be a step change in our understanding of the nature and development of the multi-dimensional space underpinning neural object processing. This will ultimately facilitate the diagnosis and treatment of brain disorders across the lifespan and accelerate the development of intelligent machines. | 75,712.00 | 151,090.50 | 148,129.50 | 72,751.00 | 447,683.00 |
| | **National Interest Test Statement**<br>We easily identify objects in daily life, but our understanding of how the brain does this is far from complete. The current project combines brain recording with artificial intelligence to study how object recognition develops in the brain from infancy to adulthood. The project will lead to a new model of object recognition, which can be translated into smart machines. This has major economic and commercial benefits for industries that rely strongly on automated object recognition. For example, there have been countless incidents of self-driving vehicles causing dangerous situations due to very basic failures in object recognition, such as not being able to detect a bus or a child. Understanding how human infants develop robust object recognition in their first year, once translated into smart machines, would help avoid such problems in the future and put Australia at the forefront of new developments in smart technologies. | | | | | |
| DE230101728<br>Hanckel, Dr Benjamin J | **Examining Youth Digital Wellbeing in Australia and the Philippines**<br>Digital technologies are being harnessed for their potential to enhance health and wellbeing. How digital health interventions provide support across national borders in the ‘real world’ and lives of young people are key questions in the realisation of global health. Focused on sexual health and mental health interventions for marginalised young people, this DECRA project is a direct response to this concern. The project examines the promise of transnational digital health interventions from the perspective of these marginalised young people across two key sites: one high-income country (Australia) and one middle-income country (Philippines). | 69,856.00 | 141,544.00 | 147,250.00 | 75,562.00 | 434,212.00 |
| | **National Interest Test Statement**<br>Better digital health support services are crucial for positive health outcomes of young Australians. Digital services offer new opportunities for health interventions to be delivered to diverse young people. Initiatives such as mental health and peer-support programs promise lower costs of implementation and greater accessibility for young people. However, further research is required into how such practices can best enhance the wellbeing of young people in and across different settings. This project responds to this concern by assessing young people’s experiences of digital mental and sexual health interventions across Australia (a high-income country) and the Philippines (a middle-income country). By working closely with professional stakeholders and young people in each country, the project will co-design and co-develop targeted public health messaging, practitioner guidance and support as well as policy frameworks that enable youth health and wellbeing. The project aims to reduce disparities between young people across Australia and the Philippines, positioning Australia as a world leader in the use of supporting research into digital technologies for health. Australian youth and society at large will benefit from innovative solutions and strategies to improve wellbeing. | | | | | |
| | **Western Sydney University** | 145,568.00 | 292,634.50 | 295,379.50 | 148,313.00 | 881,895.00 |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **New South Wales** | | 4,601,118.50 | 9,163,491.00 | 9,074,698.00 | 4,512,325.50 | 27,351,633.00 |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **Queensland** | | | | | | |
| **Griffith University** | | | | | | |
| DE230100451 | **Quantifying thermal environmental impact on office productivity** | 77,303.00 | 149,591.50 | 140,313.00 | 68,024.50 | 435,232.00 |
| Zhang, Dr Fan | This project aims to quantify thermal environmental impacts on office productivity. It expects to firmly dismiss the prevailing misbelief that an indoor temperature of 22 °C leads to maximum workplace productivity, and create a paradigm shift in building management practice in commercial buildings. Expected outcomes of this project include a novel productivity metric, a standard measurement protocol for assessing thermal environmental impacts on office productivity, and world first indoor thermal environmental control guidelines tailored to diverse cognitive activities in the workplaces of different industries. This should provide cost-effective solutions to reduce building energy use while maintaining optimum workforce productivity. | | | | | |
| | **National Interest Test Statement**<br>A typical office building's heating, ventilation and air-conditioning system accounts for 40% of its energy consumption. In developed countries, like Australia, much of this energy is used wastefully to over-cool these buildings in the mistaken belief that this optimises the productivity of those working in them. Combining laboratory experiments with field tests in offices, this project will develop tools to quantify the impact of indoor temperature on occupant productivity and provide a new technical guide for facilities managers to control thermal environments better suited to different job activities in commercial buildings. The aim is to have these guides adopted by The Green Lease Handbook and various building energy rating tools widely used for evaluating building performance. This will save building operational energy, costs and significantly reduce CO2 emissions, delivering substantial economic and environmental benefits in line with various UN Sustainable Development Goals. | | | | | |
| DE230101072 | **Investigating the agency of Aboriginal Frontier War memorials** | 77,417.50 | 152,062.50 | 149,935.00 | 75,290.00 | 454,705.00 |
| Foley, Dr Fiona L | This project aims to unite conflicting versions of Australian history by investigating the impact and effectiveness of Australian Aboriginal Frontier War memorials. It will expand our understanding of the shared sacrifices by First Nation and settler Australians during the frontier war and demonstrate the reconciliatory potential of memorialising art informed by Indigenous oral history and creative arts research and practice. The social and cultural benefits include developing a new understanding of the historical construction of Australian national identity and the potential of Indigenous art to transform the function of Australian military monuments as well as a permanent archive of short documentary films and publication. | | | | | |
| | **National Interest Test Statement**<br>This project contributes to the current recalibration of Australian war memorialisation, which has to date been largely founded on military campaigns in foreign lands. The project contributes to the national strategy of Closing the Gap (2019) by illuminating Indigenous voices in the ongoing truth-telling necessary to understand our shared history. Such memorialising will help conciliate the intergenerational and transgenerational trauma for Indigenous Australians who have until recently been refused the right to express the forfeiture and grief of the colonial conflicts in the form of public monuments. These social and cultural benefits will be enhanced by the economic impacts of establishing aesthetically powerful and inclusive war memorial sites for regional, national and international tourism. | | | | | |
| DE230101327 | **Assessing the impacts of droughts and water extraction on groundwater** | 67,500.00 | 140,500.00 | 146,500.00 | 73,500.00 | 428,000.00 |
| Ndehedehe, Dr Christopher E | This project aims to develop a novel framework that uses big data from satellites to assess the impacts of droughts and water extraction on groundwater resources in Australia, currently poorly understood and difficult to monitor. This project expects to generate new insights into the mechanisms driving changes in groundwater availability and identify risks from sustained groundwater extraction. Expected outcomes include a new national capability to assess and monitor groundwater resources from space and providing data for government, farmers, communities and traditional owners to better prepare for future droughts, increase disaster preparedness, and sustainably manage groundwater resources in a changing climate. | | | | | |

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| | **National Interest Test Statement**<br>More than 50% of the world's largest aquifers are showing rapid declines in groundwater storage, jeopardising global food and water security and ecosystems' sustainability. Still, the impacts of drought and water extraction on Australia's groundwater resources are poorly understood and difficult to monitor, threatening national water security and drought resilience. This project will enable unprecedented ways of harnessing big data from satellites to assess groundwater status, improving the capability of water resource management agencies to monitor water availability and sustainably manage these critical resources. This will help farmers and communities to reduce adverse outcomes from drought by enabling earlier access to meaningful data to inform production decisions. The project will further operationalise the use of this data for environmental monitoring that could readily be incorporated into the workflows of existing online water monitoring platforms, generating publicly accessible groundwater information and contributing to expanding global markets for Australian satellite-based monitoring. | | | | | |
| DE230101466<br>de Andrade, Dr Dominique F | **Violent offenders in the night-time economy: Building the evidence**<br>Alcohol-related violence in entertainment precincts is a significant community safety problem. This project aims to improve knowledge on individuals that are violent in entertainment precincts. It is expected to be the first study globally to use linked data to develop multi-system informed offending trajectories of violent offenders in these settings, examine the impact of patrons bans on offending trajectories, and apply situational action theory to alcohol-related violence. Results are expected to inform a critical knowledge gap and assist in the development of targeted violence preventive responses which reduce harm and make communities safer. | 74,232.50 | 147,744.00 | 147,129.00 | 73,617.50 | 442,723.00 |
| | **National Interest Test Statement**<br>Addressing alcohol-related violence in the night-time economy is a significant crime and public health problem of national priority. This program of research is expected to have significant societal and economic benefits; improving knowledge on offenders that are violent in late-night entertainment settings and identifying opportune times over the life course for effective intervention and prevention. It will also provide critical knowledge on the impact of patron bans (an existing targeted response) on offending behaviour. This program of research responds to national priorities. It is expected to advance the priorities of the Commonwealth Government's 2018 National Crime Prevention Framework, responding to the need to reduce alcohol-related violence and improve safety for young people. It is also expected to advance the coordinated Commonwealth, State and Territory Governments' 2019-2028 National Alcohol Strategy by responding to the need to improve community safety and amenity. | | | | | |
| | **Griffith University** | 296,453.00 | 589,898.00 | 583,877.00 | 290,432.00 | 1,760,660.00 |
| **James Cook University** | | | | | | |
| DE230100284<br>Quigley, Dr Kate M | **Adaptation potential of Australia's coral reefs to a changing climate**<br>Oceans are changing. Coral reefs are wonders of high socio-economic value threatened by climate extremes. This project aims to identify reefs that support the most fundamental biological processes for ecosystem-scale resilience: dispersal, symbioses, and adaptation. To urgently prepare against extinction, this project expects to deliver ground-breaking estimates of coral evolution by integrating genomics and innovative disease models. Expected outcomes include the discovery of reefs that can survive extremes and repopulate other reefs, providing benefits in optimized capabilities to protect resilient and vulnerable reefs to sustain future ecosystem services and boosting Australia as a global leader in the conservation genomics revolution. | 74,351.00 | 148,963.50 | 144,922.50 | 70,310.00 | 438,547.00 |
| | **National Interest Test Statement**<br>Australia's World Heritage listed coral reefs hold immense economic and commercial value for fisheries, jobs, tourism, and the protection of coastal development. Hence, maintaining healthy reefs into the future is worth billions of dollars. Listed reefs are some of the most environmentally significant and unique places on Earth; only awarded to locations of outstanding universal socio-cultural and biological value for humanity. Warming from climate change poses significant risks to coral health and 90% of reefs could be lost by 2050. This project will integrate novel and state-of-the-art methods in genetics, animal movement, and disease modelling to provide new knowledge on the speed at which corals may adapt to warming. By identifying resilient and vulnerable reefs, it will support urgently needed, but currently lacking, climate change risk-management strategies for reefs. These outcomes will improve the effectiveness of conservation protection and management of nationally and globally significant reefs to ready them for climate change impacts. | | | | | |

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|---|---|---|---|---|---|---|
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| DE230100553 | **How does morality influence adaptation to climate change?** | 71,340.50 | 143,766.00 | 148,268.50 | 75,843.00 | 439,218.00 |
| Lau, Dr Jacqueline D | This project aims to understand how morality influences adaptation to climate change in the Great Barrier Reef region. This project expects to generate new knowledge in the critical area of climate change adaptation, using an interdisciplinary approach. Expected outcomes include empirical insights into the connection between morality and adaptation, international collaborations, theory development, and refined methods to help identify leverage points for incorporating morality into climate change decision-making. This should provide significant benefits, including a basis for policy-making in Australia and globally, that supports effective and just adaptation to climate change in ways that sustain livelihoods and respect local values. | | | | | |
| | **National Interest Test Statement**<br>Climate change poses significant challenges to Australia's economic prosperity, environmental sustainability, and community wellbeing. Developing climate change policy that is fair and acceptable for communities is an issue of national importance. This project will generate new knowledge on how people's morality (beliefs and values about the 'right' and 'wrong' way to behave) helps or hinders their ability to adapt to climate change. Through community engagement, including workshops and interviews, the project will deliver practical strategies for incorporating morality into decision-making by policy-makers and local and regional governments in the Great Barrier Reef region. Ensuring that policies align with local moral values, the project will assist governments, industries, and communities to identify ineffective options and avoid conflict, saving time and money. In the long term, the application of strategies developed through the project will contribute to stronger and fairer decision making for communities and sectors at the forefront of climate change challenges. | | | | | |
| | **James Cook University** | 145,691.50 | 292,729.50 | 293,191.00 | 146,153.00 | 877,765.00 |

## Queensland University of Technology

| | | | | | | |
|---|---|---|---|---|---|---|
| DE230100135 | **Regulating the Future of Protein** | 74,148.50 | 150,222.00 | 151,278.00 | 75,204.50 | 450,853.00 |
| Johnson, Dr Hope N | Australia needs to produce more protein, sustainably into the future. This project aims to determine how this can be achieved by developing optimal ways of regulating alternative proteins. Alternative proteins imitate meat and dairy but are often made using new technologies. This project combines an innovative mix of empirical and legal analysis to understand the full range of expectations, opportunities and risks regarding alternative proteins and their regulation. It uses this new knowledge to determine how to regulate for healthy, sustainable and prosperous future food systems. Expected outcomes include a new approach to regulating food and the creation of new pathways for stakeholder engagement in regulation for better food futures. | | | | | |
| | **National Interest Test Statement**<br>This project will investigate innovative approaches to the regulation of new meat and dairy alternatives, such as lab-grown burgers, that adopt novel technologies. The currently under-regulated development of these new foods in rapidly expanding industries in Australia and globally offers potential benefits, but also significant health, safety and sustainability challenges and risks. Integrating legal and empirical methods, the project will deliver health, environmental and commercial benefits for the nation by resolving competing ideas about how new food products should be regulated for consumer safety and informing future legal guidelines that protects and enhances Australia's deserved reputation as a global leader in premium, environmentally sustainable foods. The project will also create new opportunities for engagement between industry and consumers of new meat and dairy alternatives. | | | | | |
| DE230100140 | **Improving the Outcomes of Indigenous Boarding School Graduates** | 70,553.00 | 142,606.00 | 147,931.00 | 75,878.00 | 436,968.00 |
| Rogers, Dr Jessica (Jessa) A | This project generates evidence that is urgently needed to improve Indigenous Australian boarding school outcomes, by examining the life paths and experiences of recent graduates. It draws on rich qualitative data regarding Indigenous graduate experiences, to examine practices that affect retention, attainment, post-school pathways and cultural wellbeing. This project expands a novel Indigenous research method, photoyarn, to amplify the voices of Indigenous participants using digital co-research processes. Providing first-hand evidence to inform Indigenous education policy, this project also produces best practice guidelines for Australia's boarding school industry, toward closing the gap in Indigenous boarding graduate outcomes. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>This project seeks to increase knowledge of Indigenous Australian boarding school graduate experiences, toward improving school-based practices and post-school pathways. Centring the voices of Indigenous boarding school graduates who have completed school within the past five years, it examines post-school employment, education and cultural wellness outcomes to generate evidence urgently needed to inform boarding school practices in Australian boarding schools. Practically, this project develops best practice guidelines to assist private and public schools with Indigenous boarders, scholarship and philanthropy programs, and policymakers in navigating the complex away-from-home schooling experiences faced by Indigenous students who often have no access to local high schools. This project has social and cultural benefits for the Australian community, the outcomes of this project supporting Indigenous young people to maintain cultural knowledge while separated from family and community. Knowledge produced will inform Indigenous boarding practices and national Indigenous education policy toward Closing the Gap. | | | | | |
| DE230100912<br>Rieger, A/Prof Janice L | **Co-creating Cultures of Inclusion: Redefining Access to Cultural Heritage**<br>This project aims to respond to an identified injustice, as access to cultural heritage is still very limited for people with disability. Cultural tourism has one of the largest draws globally, but most cultural institutions are still not understanding equitable access to encourage inclusive cultural tourism and widen participation. As a world-first study this project will create an innovative co-design model of practice, through an ecological framework and inclusive multi-sensorial explorations that can be translated and adopted by national, state, university, and regional museums and galleries across Australia and globally. This timely project will benefit all Australians by co-designing greater access to our cultural heritage for all. | 76,778.00 | 153,431.00 | 152,956.00 | 76,303.00 | 459,468.00 |
| | **National Interest Test Statement**<br>This project will improve access to museums and galleries for people with disabilities. The research will build an evidence base through surveys, interviews, workshops and digital storytelling to better understand the physical and social barriers that people with disabilities face in accessing their cultural heritage, and how they come to know cultural objects using various senses (e.g., haptics and touch). The project website will give open access to an Inclusive Toolkit, a guide for cultural tourism operators, and 20 Digital Stories in which people with disabilities share their experience of galleries and museums. National access guidelines will be created for disability organisations, the cultural tourism sector, and more than 1,000 museums and galleries across Australia. An inclusive screening of the digital stories will involve people with disability and stakeholders from government, tourism and the cultural sector in discussion of policy, practice and advocacy. Benefits include more inclusive cultural tourism, higher visitor numbers, and a strengthening of Australian cultural and civic identity. | | | | | |
| DE230100950<br>Williams, Dr Penelope J | **Automated People Management: When algorithms manage employees**<br>This project aims to explain the impact of technologies that automate people management. Through four integrated studies, this project expects to generate new knowledge on a currently invisible set of managerial and industrial practices that are profoundly reshaping work and employment relations. Expected outcomes include the first typology of automated people management technologies that will be used to reveal where and how automated people management is occurring in Australia and its effects on managers and workers. This much needed research should provide significant practical benefit to organisations and inform emerging policy and frameworks for the responsible adoption of AI and digital technologies in Australian workplaces. | 78,604.50 | 155,716.50 | 150,794.50 | 73,682.50 | 458,798.00 |
| | **National Interest Test Statement**<br>Ensuring the safe and responsible use of AI and digital technologies to deliver business growth is a priority for the Australian government. Increasingly, Australian workplaces are automating the management of employees using artificial intelligence, yet little is known about the impact of these technologies and workplace practices. This project will provide urgently needed empirical data that contributes to the national technology agenda. It will clarify for Australian organisations the types of people management technologies currently available and the extent to which they address the challenges of managing increasingly dispersed workforces. Reflecting on the adequacy of existing privacy and surveillance regulation and guidelines, the project will also inform the development of national policies and guidelines on the use of AI and digital technologies, helping to deliver economic value and quality workplace experiences for the benefit of all Australians. | | | | | |

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| DE230101053 | **Influence of parent and educator feeding practices on child self-regulation** | 73,933.00 | 147,386.00 | 151,345.00 | 77,892.00 | 450,556.00 |
| Byrne, Dr Rebecca A | This project aims to be the first study to investigate whether children who experience consistent and responsive feeding practices both at home and in early childhood education and care have higher levels of self-regulation, optimal eating behaviour and diet quality. The project expects to develop simple and low-cost strategies that parents and educators can use at mealtimes to enhance child self-regulation. With one million Australian children in care during their parent's working week, outcomes of this project have widespread benefits. Higher self-regulation improves a child's health and well-being and provides short- and long-term social and economic benefits including school readiness, academic achievement and workforce participation. | | | | | |
| | **National Interest Test Statement**<br>Investing in optimal child health and well being in the earliest years of life reaps returns for the individual, their family and the wider Australian Community. This project aims to develop simple strategies that parents and educators in early childhood education and care can use at mealtimes to enhance child self-regulation, eating behaviour and diet quality. With one million Australian children in care during their parent's working week, outcomes of this project have widespread benefits. Higher self-regulation improves a child's health and well-being and provides short- and long-term social and economic benefits including enhanced school readiness, academic achievement and increased workforce participation. These strategies align with the existing Early Years Learning Framework and can be incorporated into the curriculum of educator training programs and ECEC centre routines at minimal cost. This has potential for commercial benefits for ECEC centres as they use this as evidence to support adherence to the National Quality Standards and promote their high quality care services to families. | | | | | |
| DE230101196 | **Data-Driven Design for 3D Printed Materials with Tailored Fracture Response** | 71,517.50 | 146,906.00 | 147,988.50 | 72,600.00 | 439,012.00 |
| Da, Dr Daicong | Fracture is the main source of material failure and may cause serious engineering disasters and even death. This project aims to develop a Data-Driven Design System that intelligently optimizes local materials and architectures for heterogeneous structures with desired fracture response, and enhancing their mechanical fracture properties including stiffness, strength, toughness, and failure displacement. It will open up a new and promising research field in mechanics and data-driven science that deals with intractable inverse problems in broad engineering fields. Economic, high-performance, and customized 3D printed structural materials will be generated to benefit national corporations and enterprises and meet the high-end industry needs. | | | | | |
| | **National Interest Test Statement**<br>Natural materials such as bone contain soft (collagen) and hard materials (minerals), enabling them to bear larger loads than collagen alone and be more resistant to fracture than mineral structures. 3D printed materials with hard and soft areas can mimic these properties but millions of possible arrangements make predicting properties by trial and error impractical. This project will develop a model to calculate the properties of over 100,000 arrangements of two materials commonly used in 3D printing, then use artificial Intelligence to find new arrangements of hard and soft areas that will improve performance in bone replacement materials, aerospace materials, building structures or energy system components. Benefits will range from implants that improve quality of life to stronger electronic components and large-scale structures that are less prone to breakage. Underpinning the advanced manufacturing initiatives in Australia, bespoke software will be licensed using QUT's strong links with biomedical companies, while outcomes will be translated by collaborative partnerships with Australian industry. | | | | | |
| DE230101233 | **Addressing the Crisis of Local Visual News in Regional and Remote Australia** | 76,309.50 | 148,736.00 | 150,883.50 | 78,457.00 | 454,386.00 |
| Thomson, Dr T.J. | This project aims to measure the volume and quality of visual content on regional news platforms by diverse publishers in eight key geographic areas. It is the first in Australia to examine the full cycle from production through presentation to consumption for local visual news in a regional context. Expected project outcomes include enhanced relationships between journalists and communities, stronger regional news ecosystems, and a more representative local visual news product. These outcomes boost the academic understanding of an understudied area, help regional Australia, including regional Indigenous Australia, see itself in the journalism that is produced in the regions, and provide commercial benefits to hard-hit news providers. | | | | | |

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| | **National Interest Test Statement**<br>Journalism is vital to the public good, but regional and remote communities lack the same access to local news as their urban counterparts. This is especially true for local visual news, which is often an afterthought despite its importance in creating high-quality news content, engaging audiences, and shaping public perceptions. This project will observe local journalists at work and evaluate their output against the needs expressed by their communities, thus facilitating a much-needed conversation between local journalists and audiences. In doing so, it defines what quality local visual news should be like, and through local newsroom briefings and events co-hosted with industry provides guidance on how journalists can best produce it. Directly informed by local perspectives, this best-practice guidance is immediately actionable and serves to boost local newsrooms' sustainability, helping regional and remote Australia see itself in the news it consumes, enhances local communities' democratic resilience, and leads to a strengthened national identity. | | | | | |
| DE230101558<br>Matamoros Fernandez, Dr Ariadna | **Taking humour seriously for online safety**<br>Harmful humour impacts on women's wellbeing online, but is poorly managed by social media platforms, and has not been integrated into online safety regulation and policy. This project aims to bring together sociocultural theory, social media analysis, and interviews to better understand the dynamics of harmful humour online in Australia. It will work with users, community leaders and industry stakeholders to evaluate current platform and policy responses and how they could be improved. The anticipated outcomes include theoretical advances, workable principles for better content moderation processes that reduce harm without restricting healthy expression, and evidence-based contributions to debates on online safety regulation. | 65,000.00 | 130,000.00 | 135,000.00 | 70,000.00 | 400,000.00 |
| | **National Interest Test Statement**<br>This project contributes to efforts to improve online safety and wellbeing in Australia, including the work of the Australian eSafety Commissioner and Online Safety Act 2021. It focuses particularly on the challenge of harmful humour targeted at women on social media platforms. Harmful humour poses a threat to social inclusion and cohesion, but is difficult to identify and highly context-specific, and therefore challenging for global platforms to manage on their own. The proposed project will undertake a detailed analysis of harmful humour in the Australian context, and provide evidence of how they impact women's wellbeing online. Using advanced social media analysis and working directly with users and industry stakeholders, the project will generate evidence and guidance that can be used by platforms and regulators to tackle harmful behaviour in Australian social media, without hindering healthy free expression. | | | | | |
| | **Queensland University of Technology** | 586,844.00 | 1,175,003.50 | 1,188,176.50 | 600,017.00 | 3,550,041.00 |
| **The University of Queensland** | | | | | | |
| DE230100036<br>Cheetham, Dr Seth W | **Tracing the epigenetic life-history of cells**<br>Each cell of the human body contains identical genetic information that is activated in different ways to form varied cell types. This research aims to develop novel single-cell genomic technologies to explain the origins of different cell types. This project expects to discover the molecular mechanisms through which specialised cell types are formed, which has been difficult to decipher using existing methods. My novel approach will elucidate how a small population of seemingly homogenous cells can give rise to a myriad of types of cells. Tracing the life histories of cells across time should lead to broad applications including in developmental biology, neuroscience and immunology. | 77,026.00 | 155,012.00 | 155,875.50 | 77,889.50 | 465,803.00 |
| | **National Interest Test Statement**<br>Understanding how a single cell (the fertilised egg) becomes a myriad of different cell types in the human body is a central objective of developmental biology. This project aims to develop an entirely novel method to trace the life histories of cells as they develop from the egg to stem cells into specific cell types e.g. brain, muscle, liver. This new approach will enable identification of the precise moments the future fate and function of an individual cell is decided. Expected outcomes include new understanding of the mechanisms underlying tissue growth that can be used to manufacture cells for different parts of the body or manipulate the behaviour of cells in plants and animals. This has applications including improving drought tolerance in crops, developing disease resistant livestock, or growing tissues for use in medicine which will position Australia at the forefront of the multibillion-dollar stem cell industry, while bringing broader economic and health benefits for Australians. | | | | | |

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| DE230100114 | **Novel interlayered membrane for highly efficient separation processes** | 73,259.00 | 144,018.00 | 141,518.00 | 70,759.00 | 429,554.00 |
| Yang, Dr Zhe | The project aims to develop high-performance membranes with excellent permeability and selectivity to allow efficient separation processes with reduced energy consumption and products with high purities that cannot be achieved by conventional membranes. By introducing the functionalized interlayer, the novel membrane can achieve up to an order of magnitude higher solvent permeance with significantly enhanced solvent-solute selectivity. Machine learning algorithms will be applied to search for the ideal interlayer based on a newly-launched online and comprehensive database. This project will contribute to accelerating Australia's progress towards net-zero carbon emission and allowing a sustainable environment. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project contributes to Australia's national interest through the development of a new membrane technology that will lower cost and increase productivity for key Australian industries, including water, food, dairy, mining, and energy. Membranes are materials that let some things pass through and stop others, and are used to separate liquids and gases or to filter unwanted substances. Conventional membrane technology is limited as it is unable to produce large amounts of yield efficiently and effectively and therefore consumes high amounts of energy but generates a low-quality product. The goal of the project is to address this challenge by developing new membranes that have structures that allow better filtration using less energy. Many Australian industries, particularly pharmaceutical purification companies and major resource recovery industries, will be able to take advantage of these new membranes. This project expects to strengthen Australia's capacity in advanced manufacturing and assist Australia in lowering emissions by 2050. | | | | | |
| DE230100147 | **Glassy metal-organic framework membranes for CO2 separation and conversion** | 72,859.00 | 145,718.00 | 145,718.00 | 72,859.00 | 437,154.00 |
| Lin, Dr Rijia | This project aims to develop a new class of glassy metal-organic framework (MOF) membranes for CO2 separation and conversion. By constructing membrane reactors, it is expected to simultaneously separate CO2 from gas mixture and subsequently convert it into value-added chemicals in a continuous single operating unit. The expected outcomes include fabrication techniques for ultrathin MOF glass membranes, cutting-edge knowledge in advanced MOF membrane design, a new generation of MOF devices, and efficient membrane reactors for CO2 conversion with mixed gas feed. This project expects to accelerate the development of low-carbon technologies and provide significant benefits in mitigating the adverse effects of anthropogenic CO2 emissions. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project closely aligns with Australia's Long Term Emissions Reduction Plan released in 2021, which aims to achieve net zero emissions by 2050. This project will develop new membrane reactors that enable simultaneous carbon dioxide capture from dilute sources and carbon dioxide reduction using Australia's abundant solar energy. Substituting separation and conversion of carbon dioxide in a single operating unit will significantly reduce the cost of the system via eliminating carbon dioxide transport and storage processes, thus promoting the efficient and profitable conversion of carbon dioxide emissions into fuels and valuable chemicals. It will provide substantial environmental benefits to Australia and the world, and position Australia at the forefront of carbon dioxide utilisation and solar energy conversion. This project will also deliver scalable techniques for new-generation membranes, which are highly promising for industry-level applications. It should lead to commercial benefits in the national priority of advanced manufacturing and improve Australia's competitiveness in the global market. | | | | | |
| DE230100173 | **Strain-stabilised perovskite optoelectronics: from fundamentals to devices** | 77,761.00 | 150,090.00 | 135,270.00 | 62,941.00 | 426,062.00 |
| Steele, Dr Julian A | This project aims to develop deep structure-property relationships and strain engineering protocols to generate stable forms of the emerging inorganic halide perovskite semiconductors, which are promising for next-generation solar cells and light emitting diodes. This project expects to arrive at working light emitter and detector prototypes via a three-dimensional, multi-length scale strain engineering approach that utilises materials processing techniques already used in the semiconductor industry. The expected outcomes include the development of new stabilisation methods which are compatible with facile and scalable device processing, which will directly impact the success of future perovskite optoelectronic devices and technologies. | | | | | |

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| | **National Interest Test Statement**<br>Australia’s dependence on non-renewable energy generation has seen no decrease in the past ten years, which contributes directly to global warming and approximately 20% of the electricity used is for lighting loads. Consequently, the global solar cell market ($250B, 2021) and LED lighting market ($90B, 2021) are expected to grow rapidly in the coming ten years. This project will develop next-generation optical materials, known as halide perovskite semiconductors, which are cheap and easy to make, as well as capable of effectively converting light into electricity, and vice versa. While these optical materials are extremely promising, they remain unstable, hindering real-world adoption. This project aims to develop new ways of stabilising halide perovskites within working prototypes and help device engineers to move beyond older semiconductor technologies, like silicon, which have slowed with respect to realising more efficient and energy conservative optical devices. Market-relevant intellectual property will also be secured via project outcomes that are compatible with the existing semiconductor industry. | | | | | |
| DE230100357<br>Lu, Dr Haijiao | **Catalyst design for converting carbon dioxide into valuable chemicals**<br>This project aims to use solar energy to convert carbon dioxide, the primary greenhouse gas that drives global climate change, into valuable chemicals via catalytic reduction. This project expects to facilitate the selective production of valuable ethylene from carbon dioxide reduction by developing novel cocatalyst materials derived from metal-oxo cluster molecules. Expected outcomes include fundamental understanding of the structure-property relationship in new catalytic systems, and technological breakthroughs in reducing carbon dioxide emissions. The success of this project will bring significant environmental and economic benefits, and position Australia at the frontier of global transition to a low-carbon economy. | 66,553.00 | 134,606.00 | 138,006.00 | 69,953.00 | 409,118.00 |
| | **National Interest Test Statement**<br>Ethylene is a chemical building block used to manufacture a range of plastics and resins for in-demand consumer and industrial products, such as packaging materials. The global market for ethylene is worth more than USD 160 billion (2019), and almost all this ethylene is currently produced from fossil fuels. This conventional ethylene production consumes vast amounts of energy and emits huge amounts of carbon dioxide, which contributes to global warming. This project will develop new catalytic technologies that can use Australia's abundant solar energy to convert carbon dioxide into the valuable ethylene. It will thus switch ethylene production from a carbon dioxide emitter to a carbon dioxide consumer. The development of these technologies will contribute to achieving Australia’s 2030 Emissions Reduction Target and improving the environment and sustainability. Besides the environmental benefits of this project, the scientific and technological progress will also accelerate Australia's transition to a low-carbon economy. | | | | | |
| DE230100373<br>Letten, Dr Andrew | **The role of resource fluctuations in structuring microbial communities**<br>The flow of nutrients through ecological systems fluctuates through time and yet the impact this variability has on the maintenance of biodiversity is poorly understood. Drawing on emerging theory and a tight integration of modelling and experiments in a model microbial system, this project aims to investigate the impact of modified nutrient regimes on the structure and stability of ecological communities. This project expects to generate new knowledge at the forefront of research into diversity maintenance, ecosystem functioning and higher-order interactions. The outcomes should provide a deep mechanistic understanding of microbial community dynamics, with applications from animal health to environmental flows and insect pest management. | 76,744.00 | 152,994.50 | 146,916.00 | 70,665.50 | 447,320.00 |
| | **National Interest Test Statement**<br>Diverse communities of microbes (bacteria, fungi and viruses) influence the health of people, plants, animals and the environment. However, we lack a clear understanding of why the microbes found in one person’s gut, or a farmer’s field, may be very different from those of their neighbours. Understanding these differences is key to promoting beneficial microbial communities that support animal and human health, agricultural production, and biosecurity in Australia. This project will explore how changes in the availability of nutrients (e.g., fasting vs. snacking) affect microbial communities found in the animal gut. A better understanding of how cycles of feast and famine impact microbial communities will provide a critical foundation for translational research into the optimisation of animal diets for adoption by farmers, or collaboration with agritech partners to develop fertiliser schedules targeting soil productivity. This would deliver economic benefits such as increased agricultural productivity and reduced costs, and improved wellbeing for people and animals. | | | | | |

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| DE230100466 | **Establishing a national program to characterise indoor chemical exposures** | 66,634.50 | 135,491.50 | 140,136.50 | 71,279.50 | 413,542.00 |
| Wang, Dr Xianyu | This project aims to establish the first Australian indoor air monitoring program that identifies hazardous chemicals and their sources and trends under a changing climate. The project expects to provide key evidence to policy-making decisions including prioritising indoor chemical threats for regulation. The expected outcomes include the establishment of criteria for home recruitment for indoor pollution research, identification of new chemical pollutants and their sources, and assessment of their trends. The benefit is to advance the knowledge on indoor exposure research, raise the awareness of the climate change conditions, addressing the government priority research area of Environmental Change. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australians spend most of their time indoors, but there is a poor understanding of what chemical pollution they are exposed to while inside. This DECRA aims to establish an Australian indoor exposure monitoring program that allows the characterisation of hazardous chemicals in the home and their sources and trends. As a changing climate impacts the way houses are built and lived in, this program will also assess the effects of climate and climate change on indoor pollution. This program will inform the government and is expected to lead to a reduction of indoor chemical exposures through better building design and improved regulation of products in homes. In Australia, health issues related to poor indoor air quality cost approximately $12 billion annually. Reducing chemical exposures in homes will therefore improve quality of life for all Australians, while delivering substantial economic benefits by reducing the health care burden related to indoor pollution. | | | | | |
| DE230100687 | **Child sleep development in the context of family work lives** | 79,049.00 | 153,177.00 | 152,939.00 | 78,811.00 | 463,976.00 |
| Staton, Dr Sally L | Sleep in early childhood is the single most critical activity for healthy brain development. Yet, a third of young children are identified by their parents as having a sleep problem. This study aims to test the hypothesis that social mechanisms underpin developing sleep patterns and problems. The study examines the change in sleep patterns as children enter non-parental care and the daily and weekly regularity of sleep as they transition between home and their diverse care arrangements. Discovery of the ways family work lives influence child sleep presents the potential to offer new solutions to support healthy sleep development and avert sleep problems. The benefits are for caregivers, family well-being, and children’s development. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | A child’s early sleep patterns are significant in the short and long term. Sleep is the single most critical activity for healthy brain development in early childhood with potential to affect wellbeing and achievements across the life course. Sleep problems incur significant human and economic cost. For the child, sleep problems are implicated in reduced capacity for attention, learning, behavioural regulation, and poorer health outcomes. For parents, sleep disruption reduces work productivity and well-being with estimated cost to the Australian economy of $45 billion per year. Parent work and the child's care patterns affect sleep regularity. Yet the effect on child development is not well understood. This study brings together sleep science and the social science of family lives in an international first examination of the effects of care patterns on child sleep development and wellbeing. Such evidence presents opportunity to guide appropriate parental and non-parental care practices and promote optimal development with benefit to children, families, social wellbeing, and the economy. | | | | | |
| DE230100836 | **Indigenous Policy and Political Relationships in Settler Colonial States** | 60,475.00 | 127,475.00 | 132,500.00 | 65,500.00 | 385,950.00 |
| Strakosch, Dr Elizabeth S | This project aims to study the relationship between Indigenous policy systems and foundational political relationships in Australia, the US, Canada and New Zealand via in depth case studies. Across all four states, policy struggles to substantively improve Indigenous wellbeing, but Australia has the poorest results and weakest formal political recognition. Expected outcomes include a new approach to understanding Indigenous policy that links policy dynamics to conflicts between settler and Indigenous sovereignties and comparative policy data across the English Speaking settler colonial states. It will benefit Australian Indigenous and policy communities by showcasing international best practice in policy collaboration and effectiveness. | | | | | |

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| | **National Interest Test Statement**<br>Indigenous disadvantage in health, education, and employment remains one of Australia's most urgent challenges. A key reason behind this disadvantage is a lack of an effective Indigenous policy. This project examines the fundamental challenge of how to better use policy to improve Indigenous wellbeing, by examining for the first time Indigenous policy in the US, New Zealand, and Canada. These countries have stronger political frameworks recognising Indigenous peoples, and better policy results, as seen in a Canadian Indigenous controlled child protection program which prevents the cascading disadvantage caused by family separation. Such programs, incorporating Indigenous knowledge and leadership, could be used in Australia to address similar issues of complex disadvantage. The project will bring together Indigenous organisations, policy makers and researchers through online dialogues, to showcase effective, best practice collaborations to help Australian policy makers formulate innovative, Indigenous led strategies to reduce disadvantage for a more equal and just Australia. | | | | | |
| DE230100972<br>Favre-Bulle, Dr Itia A | **Reaching deeper into neuronal networks using optical physics**<br>Understanding the functions and intricacies of the brain is a fundamental challenge in scientific research. This project aims to develop new technologies to construct a microscope able to alter and make sense of neuronal activity in situ. This project also aims to investigate the precise role of a key brain region involved in sensory processing: the locus coeruleus. The results will reveal how this brain region influences brain dynamics as well as behaviour. Expected outcomes include state of the art microscopes, high impact publications, and international collaborations. The anticipated benefits are the high quality training of the Australian workforce and further establishment of Australia as a leader in microscopy and neuroscience. | 65,199.50 | 124,749.00 | 126,031.50 | 66,482.00 | 382,462.00 |
| | **National Interest Test Statement**<br>This project aims to develop new technologies to investigate brain function, with a particular focus on the role of a key region involved with physiological response to stress. The outcomes will reveal how this region of the brain influences attention, perception of the environment, and behaviour, which are critical for engagement in society. This project could also benefit the Australian quality of life through the longer term development of technology to enhance people's ability to pay attention and process information. To study the brain we will develop new technologies in computer analysis, and microscopy: where possible, these discoveries will be patented and licensed by our industry partners so that they can be translated into commercial products. This project will therefore enhance Australian research, train the next generation of Australian neuroscientists in our novel approaches, and generate significant long term societal, and economic benefits. | | | | | |
| DE230100998<br>Harris, Dr Lachlan I | **Should I stay or should I go? How brain stem cells leave quiescence**<br>Most adult stem cells in our brains are sleeping (quiescent). Quiescence helps ensure animals have a lifelong population of brain stem cells, which is crucial for the maintenance of brain circuitry. This project aims to investigate how this process is regulated at a molecular level. This project expects to define the molecular playbook controlling quiescence and explain why brain stem cells progress into deeper states of quiescence during aging by combining novel tissue culture and genetic models, where brain stem cells have disrupted quiescence, with innovative methods of reading gene expression. The benefits of these outcomes include the development of methods to control the quiescence of brain stem cells for bioengineering purposes. | 71,940.00 | 146,730.00 | 150,348.00 | 75,558.00 | 444,576.00 |
| | **National Interest Test Statement**<br>A feature of healthy aging in most animals is the ability of brain stem cells to continue to generate nerve cells. The mechanism enabling brain stem cells to retain some function, even in older animals, is the fact that they exist in a low activity, sleep-like state for much of life. This project seeks to uncover how this sleep-like state is regulated by combining novel and powerful experimental models, where the sleep-like state of brain stem cells is disrupted, with advanced genomic techniques such as single-cell RNA-sequencing that allow for the depth of sleep to be tracked at high resolution. Understanding how this sleep-like state is regulated will enable the design of approaches to enhance brain stem cell function. The intellectual property generated may lay the foundation for the design of new drugs or bioengineering approaches that slow cognitive decline during aging and in neurodegeneration, which will be of interest to pharmaceutical/biotechnology companies. Therefore, the findings from this project will likely lead to commercial, economic, and social benefits to Australia's aging population. | | | | | |

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

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| Approved Organisation, Approved Research Program Leader of Approved Research Program | | Estimated and Approved Expenditure ($) | | | Indicative Funding ($) | Total ($) |
|---|---|---|---|---|---|---|
| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| DE230101033 | **Scalable and Lightweight On-Device Recommender Systems** | 68,359.00 | 139,218.00 | 141,718.00 | 70,859.00 | 420,154.00 |
| Chen, Dr Tong | This project aims to address the resource-intensive and non-resilient nature of existing cloud-based personalised recommendation services. This project expects to generate new knowledge in the intersection of on-device machine learning and recommender systems. The expected outcomes include a novel auto-deployment platform that can efficiently customise a model for each user device's configuration, supporting on-device recommendation and model updates with tiny computational footprints. The benefits of these outcomes will position Australia at the forefront of AI and give numerous businesses the tools needed to deploy innovative business systems with a secure and cost-effective advantage. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Personalised recommendation services are mostly cloud-based, incurring huge infrastructure costs, resource consumptions, and privacy concerns. This project puts forward a novel on-device recommendation platform that allows each user to locally deploy a personalised recommendation model tailored for the device specification. The deployed on-device models can perform recommendations and self-updates with no dependence on the cloud server. The direct benefit will be seen in the advancement of Australia’s reputation as a leader in the era of Artificial Intelligence of Things (AIoT). The platform's personalised applications have strong real-time, privacy, and low-cost advantages, and will especially benefit the digital transformation of Australia's small-to-medium businesses with increased revenue and reduced costs in computing infrastructures. | | | | | |
| DE230101105 | **Developing Polymer Electrolytes for Operational All-Solid-State Batteries** | 72,553.00 | 141,656.00 | 138,606.00 | 69,503.00 | 422,318.00 |
| Zhang, Dr Cheng | This project aims to advance the development of safe rechargeable all-solid-state batteries (ASSBs) by innovating fluorinated block copolymers as solid-state electrolytes. ASSBs are the most promising power source for emerging energy storage goals, however, low ionic conductivity and poor long-term cycling stability are critical bottlenecks to their successful application. This project seeks to tackle these challenges by fabricating unique ionic conduction channels and stabilising electrode-electrolyte interfaces using fluorinated block copolymer electrolytes. The expected outcomes are new knowledge in polymer electrolytes and advancement in the commercialisation of ASSBs toward more efficient, safe and reliable energy storage technologies. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australia needs new battery storage technologies that are efficient, reliable and safe to meet its energy priorities. Currently available batteries that are being used in cars and homes to harness renewable energy contain flammable liquid electrolytes that are dangerous and prone to explosion. This project aims to develop an innovative technology for safe, rechargeable all-solid-state batteries that provide long-lasting energy storage capacity. This project will benefit Australia by advancing knowledge and developing intellectual property in the design and construction of market-ready solid-state batteries. With increasing demand for batteries to support renewable energy targets, the competitive advantage of the battery technology developed in this project will lead to significant economic benefits by positioning Australia at the forefront of the $600 million/year global battery storage market. The new technology will also help to secure Australia’s energy future by ensuring highly reliable electricity storage and supply for Australians. | | | | | |
| DE230101116 | **Detecting Key Concepts from Low-Quality Data for Better Decision** | 70,000.00 | 140,000.00 | 140,000.00 | 70,000.00 | 420,000.00 |
| Xu, Dr Miao | The project aims to develop data analytics techniques that aid better decision making in high-stake scenarios when data are less-trustable. While data-aided decision making has been widely used, less-trustable data may significantly distort the decisions made and hurt people impacted by these decisions. The outcome of this project expects to be a series of techniques covering data understanding and enhancement, model development and fitting, and novelty detection, to reduce the damage of less-trustable data. The research expects to benefit the people and companies impacted by data-aided decision making in cybersecurity, healthcare and financial fraud detection, providing risk-control services. | | | | | |

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| | **National Interest Test Statement**<br>Large data is an important national asset of Australia that drives evidence-based decision-making for government and a multitude of industries. This project aims to develop innovative techniques to analyse data that can be put together into a system to generate insights with minimum data preparation cost. A major issue with many existing data-driven techniques is that we do not know whether we can trust the recommendations made. The system based on our techniques will provide an understandable process to enhance transparency in data analysis. Such a process means our techniques can also be integrated into existing systems such as cybersecurity to improve risk-based decision-making by revealing how insights are generated from data. The research outcomes have strong potential to benefit Australia's economy in many data intelligence-based sectors, such as health, finance, and transport, given its great advantages for reducing costs in data preparation and improving trust in data-driven decisions. | | | | | |
| DE230101131<br>Puljevic, Dr Cheneal | **Understanding drivers and deterrents of Australia's illicit tobacco market**<br>As Australia implements policies that reduce the availability and affordability of tobacco, demand for illicit tobacco is likely to grow. This research aims to generate new knowledge about the drivers and deterrents of demand for illicit tobacco through three inter-related projects. Expected outcomes include a comprehensive understanding of factors influencing Australians' demand for illicit tobacco, and expert-informed policy recommendations to reduce demand for and deter use of illicit tobacco. With no substantive Australian research on this topic for more than 15 years, this research will be essential to reduce the impacts of the illicit tobacco market, including substantial losses in tax revenue and the funding of organised crime. | 76,552.00 | 153,102.50 | 152,467.50 | 75,917.00 | 458,039.00 |
| | **National Interest Test Statement**<br>There is evidence that Australia's illicit tobacco market is growing. As Australia implements new policies to reduce tobacco's availability and affordability, there are concerns about further stimulating this illicit market, which cost Australia $621 million in lost tax revenue in 2019-20, funds organised crime, and undermines Australia's world-class tobacco control policies. There has been no Australian research on drivers of illicit tobacco use for more than 15 years. This project will result in a world-first tool for measuring susceptibility to purchasing illicit tobacco, a comprehensive understanding of factors driving consumer demand for illicit tobacco, evidence on messages most likely to deter consumers from purchasing illicit tobacco, and expert-informed policy recommendations to reduce demand and deter use of illicit tobacco. Recommendations to deliver educational and operational activities to deter illicit tobacco use are likely to be adopted by relevant Government agencies | | | | | |
| DE230101284<br>Harrison, Dr Jessica J | **Insect-specific virus host restriction**<br>Mosquito-borne viruses are a topic of intense research due to their complex biology, ecology and evolution, and their potential to produce unpredictable outbreaks of disease in both humans and animals. Insect-specific viruses (ISVs) are viruses that replicate solely in mosquito cell and are unable to infect vertebrate tissues. This project aims to assess the biodiversity of ISVs in the Australian mosquito population and identify key factors behind their restriction in vertebrates. The objectives of the studies proposed will answer clearly defined important biological questions about ISVs, while also delivering technological advances, novel reagents and potential commercial outcomes for the control and prevention of arboviral disease. | 68,295.50 | 133,061.00 | 130,206.00 | 65,440.50 | 397,003.00 |
| | **National Interest Test Statement**<br>Alphaviruses are transmitted by mosquitoes and produce large unpredictable outbreaks of disease in humans and animals. In Australia, Ross River virus (RRV) produces debilitating arthritic symptoms in both horses and humans, while an emerging threat, Getah virus, causes reproductive losses in pigs internationally. This project will investigate newly discovered Australian alphaviruses that replicate only in mosquitoes - referred to as insect-specific alphaviruses (ISAs). The outcomes of this research will determine why these ISAs don't infect humans and other animals and how widespread they are in Australian mosquitoes. By providing insights into how disease-causing alphaviruses evolve, this will enable the use of ISAs to safely develop new vaccines and diagnostic tests against important alphaviruses (eg. RRV and Getah). This would bring significant economic benefits by safeguarding Australian agriculture against known and emerging pathogens, as well as potential health benefits. | | | | | |

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| DE230101712 | **All-perovskite tandem solar cells for efficient green hydrogen production** | 66,553.00 | 132,856.00 | 130,856.00 | 64,553.00 | 394,818.00 |
| Chen, Dr Peng | This project aims to design functional materials for the development high-performance and durable solar energy conversion devices, which enable efficient green solar hydrogen production to reduce fossil fuel consumption and alleviate environmental burden. The expected outcomes include advanced semiconducting materials, proof-of-concept solar-driven water electrolytic system with a high solar-to-hydrogen conversion efficiency, and cutting-edge knowledge in material science, physical chemistry, and nanotechnology. The success of this project expects to facilitate pilot-scale green hydrogen industry and thus position Australia at the frontier of advanced materials, clean energy, and renewable hydrogen supply technologies. | | | | | |
| | **National Interest Test Statement**<br>A key vision of Australia's National Hydrogen Strategy is the production of hydrogen from solar energy to reduce carbon emissions and support future energy needs. Hydrogen fuels can be generated by passing electricity through water, however, the current high industrial manufacturing cost of producing green hydrogen using solar electricity remains a barrier to achieving this vision. This project will develop innovative and highly durable solar cells that enable low-cost and efficient hydrogen generation from solar energy. It will offer domestic hydrogen manufacturers a reliable and green technology to make the mass production of hydrogen fuels more economically viable. The applications of this project will help establish a cost-competitive local hydrogen industry, providing economic benefits to Australia. The project will also deliver environmental benefits through reduced reliance on fossil fuels, helping Australia meet its target of net zero emissions by 2050. | | | | | |
| | **The University of Queensland** | 1,209,812.50 | 2,409,954.50 | 2,399,112.00 | 1,198,970.00 | 7,217,849.00 |
| **University of Southern Queensland** | | | | | | |
| DE230100616 | **Development of high-performance flame-retardant one-component epoxy resins** | 69,519.00 | 140,153.00 | 141,268.00 | 70,634.00 | 421,574.00 |
| Huo, Dr Siqi | This project will create a new class of phosphorus/imidazole oligomers for single-component epoxy resins with superior storage stability, fire retardancy and mechanical properties. By establishing a fundamental understanding of the structure-composition-property relationships of one-component epoxy resins, it will address two major challenges - high reactivity and short shelf life, and poor flame retardancy and mechanical properties, which limit practical applications. This project will develop environmentally benign, flame-retardant oligomers, reducing fire hazards, protecting lives, property and the environment, by replacing current flammable epoxy resins used in electrical, construction and transportation. | | | | | |
| | **National Interest Test Statement**<br>This project will develop a new class of high-performance epoxy resins with a long shelf life, fast curing rate, excellent flame-retardancy and mechanical properties applicable to the electronics, construction, and other key industries. Currently, halogenated flame retardants are added to epoxy resins. While effective, they release toxic smoke and many such flame retardants have been banned in Europe and USA. This project will develop new materials that will be halogen-free, and therefore more environmentally friendly. Through this project, new materials will be applied in construction coatings, printed circuit boards, micro-electronic devices and automotive composite parts. Knowledge will be generated to identify optimum material properties to meet the needs of different applications. The new materials will be trialled with Queensland-based partnerships with leading composite manufacturing companies. This will enable a clear pathway to translation and market uptake. | | | | | |
| | **University of Southern Queensland** | 69,519.00 | 140,153.00 | 141,268.00 | 70,634.00 | 421,574.00 |
| | **Queensland** | 2,308,320.00 | 4,607,738.50 | 4,605,624.50 | 2,306,206.00 | 13,827,889.00 |

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|---|---|---|---|---|---|---|
| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **South Australia** | | | | | | |
| **The University of Adelaide** | | | | | | |
| DE230100022 | **Investigating neuronal oscillations and motor function in older adults.** | 76,248.00 | 153,421.50 | 141,401.00 | 64,227.50 | 435,298.00 |
| Opie, Dr George M | This project aims to identify changes in brain function that contribute to age-related reductions in movement control. By implementing a novel, multimodal approach involving cutting edge non-invasive brain stimulation, this project expects to identify the causal role of brain oscillations in the ability of older adults to learn new motor skills. Expected outcomes include a critical understanding of the basic neural mechanisms that contribute to altered motor function during healthy ageing. These outcomes will provide significant benefits, including important neurophysiological insight that is required to develop targeted interventions aimed at improving movement in older adults. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Ageing is associated with an inevitable decline in our ability to move and learn. This reduces independence, quality of life, and causes substantial personal, social and economic costs. While changes to brain function likely cause this decline, the exact neural pathways involved remain unclear. This project aims to explore and understand these by identifying how changes to rhythmic brain activity contribute to reduced motor function in the elderly. It will provide critical insight into how the ageing brain changes, allowing us to better understand the brain mechanisms that determine how well the elderly can move their bodies. Furthermore, it will allow development of cutting-edge interventions that use non-invasive brain stimulation to modify brain activity and improve motor function in older adults. We expect we can help older adults maintain better physical abilities for longer, and give them greater quality of life and save money on aged care across the community. | | | | | |
| DE230100324 | **Cooperative Single Atom Catalysts for Zn-CO2 Batteries** | 65,553.00 | 134,606.00 | 131,606.00 | 62,553.00 | 394,318.00 |
| Ren, Dr Wenhao | This project aims to develop cooperative single-atom catalysts for efficient and selective electrocatalytic CO2 conversion and Zn-CO2 batteries. Cooperative catalysts at the single atom limit can potentially achieve enhanced electrochemical properties beyond state-of-the-art and will trigger significant theoretical and technological interests in energy conversion and storage fields. It is expected to generate new knowledge in materials science and electrochemistry, using interdisciplinary approaches of atom-precise material engineering, in situ characterisation and full-cell optimisation. Significant economic and environmental benefits are expected from developing carbon-neutral CO2 electrolysers with low cost and high energy efficiency. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The design and manufacture of cost-effective, safe, and reliable batteries is essential to meet current escalating energy demands both nationally and internationally. This project aims to make substantial improvements to zinc-CO2 batteries, so they provide higher energy efficiencies (voltages), longer service life, and are re-chargeable. Because these new zinc-CO2 batteries will be more reliable than lithium-ion batteries and much cheaper to produce, they will provide a battery prototype to store intermittent renewable energy (e.g., solar, wind, and water power) for daily use, which can be incorporated into grid-scale energy storage systems for adoption by the Australian renewable energy sector. New energy storage systems will also offer more flexible, cheap, and efficient energy use for consumers. | | | | | |
| DE230100377 | **Facilitating control of Queensland fruit fly and other insect pests** | 70,135.50 | 140,245.50 | 141,694.00 | 71,584.00 | 423,659.00 |
| Choo, Dr Amanda Y | This project aims to address the need for a Queensland fruit fly male-only sterile release strain for the national Sterile Insect Technique program to control this devastating Australian horticulture pest. By combining two molecular technologies in a new strain that responds to temperature cues to trigger development of only male flies, this project expects to produce twice as many sterile males for release to mate with wild females in fruit fly outbreak areas, preventing production of the next generation. Expected outcomes include significant reduction in production costs and increased efficiency of the national sterile release program, facilitating control of this damaging pest to protect Australia's billion dollar horticultural industry. | | | | | |

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Queensland fruit flies are among the most damaging pests to Australian horticulture, costing an estimated $300 million annually in damage, and threatening billion-dollar industries in fruit fly–free states. Outbreaks have a huge impact on farmers' likelihoods and consumer access to affordable fresh produce. A national Sterile Insect Technique (SIT) program is currently in place to manage and eradicate fruit flies from various regions in Australia, which involves releasing sterile flies. Sterile males will mate with wild females, preventing production of the next generation. The current program releases both sterile males and females, however only the males are useful for SIT. The goal of this project is to develop an effective male-only SIT strain with twice as many males produced. This will increase production capabilities, significantly reduce overall cost of the program and improve eradication efficiency, facilitating protection of Australia's horticultural industry, with a potential application for other insect pests. | | | | | |
| DE230100471<br>Hao, Dr Junnan | **Designing advanced Zn-ion batteries towards practical applications**<br>Aqueous Zn-ion batteries (ZIBs) are much safer and cheaper than current Li-ion batteries due to the water-based electrolyte and abundant Zn reserves. However, the state-of-the-art ZIB technique faces huge challenges for practical applications due to the low cathode capacity and poor Zn anode reversibility. This project aims to design novel cathodes with a new-type mechanism and highly reversible Zn anodes. Accordingly, on-demand large-size ZIBs and flexible devices under industrial parameters will also be developed. The success of this project will place Australia at the forefront of implementing safe and low-cost batteries in largescale smart grid systems, household markets, and wearable medical devices. | 76,053.00 | 152,106.00 | 152,106.00 | 76,053.00 | 456,318.00 |
| | **National Interest Test Statement**<br>Safe and affordable Zinc ion batteries with water-based electrolytes are regarded as an alternative to flammable and costly Lithium ion batteries; however, their development is still in the infant stage because we don't yet have all the components (electrodes) that can perform highly enough. This project will address the need for better electrodes and design advanced Zinc ion batteries for practical applications. Outcomes of this project will allow us to commercialise non-flammable Zinc ion batteries in "smart grids" or domestic solar systems where safe, low-cost and long-lasting batteries that desperately needed. The success of this project will significantly contribute to reducing the cost of energy in Australia and will also bring environmental benefits by reducing underground water pollution, carbon dioxide emissions, and climatic deterioration. | | | | | |
| DE230101011<br>Ye, Dr Chao | **Developing advanced potassium-sulfur batteries for scalable energy storage**<br>Potassium-sulfur (K-S) batteries are recognised as a promising energy storage technology for large-scale applications, due to their high theoretical capacity, low toxicity and the low cost of both potassium and sulfur. However, their grid-scale development is plagued by safety hazards and fast capacity fade. This project aims to address these challenges by developing atomic-level engineering of host materials for sulfur, K metal anode and solid electrolyte. The outcomes of this project will provide increased understanding of the mechanism for K-S batteries and novel strategies for their development, placing Australia at the forefront of K-S batteries for scalable battery research and supporting our cutting-edge energy storage technology. | 69,553.00 | 140,356.00 | 140,856.00 | 70,053.00 | 420,818.00 |
| | **National Interest Test Statement**<br>An integral part of the large-scale use of renewable energy sources is the development of cost-effective energy storage technologies. Widely used lithium-ion batteries (in portable electronic devices and electric vehicles) have many downsides – they contain flammable electrolytes, are expensive to manufacture, and lithium mining damages the environment. This project aims to develop safe and stable alternatives to lithium-ion batteries. It will use two chemicals called potassium and sulfur (K-S) in batteries and design new inexpensive, stable and non-flammable materials (including carbon-based electrode materials and polymer-based electrolyte materials) that will enhance K-S battery lifespan and energy storage capacity. These batteries will provide an energy storage solution for the Australian renewable energy sector (driven by renewable electricity generated from solar energy and wind power) and reduce the impact of battery manufacturing on the environment. | | | | | |

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| DE230101035 | **Gravitational wave detectors for observing the Cosmic Dawn** | 76,303.00 | 130,356.00 | 108,106.00 | 54,053.00 | 368,818.00 |
| Brown, Dr Daniel D | This project aims to build upon Australia's already pioneering research into the workings of the universe by addressing challenges facing future gravitational wave detectors. It will develop and utilise advanced new numerical models to generate new knowledge on large-scale precision interferometry and contribute towards the design of future detectors that are essential for gravitational wave astronomy to thrive. Expected outcomes are new optimised designs for detectors and an array of innovative new open-source numerical models for exploring new designs of quantum optics experiments. This will benefit both Australian and international research teams in the global effort to realise the third generation of gravitational wave detectors. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Gravitational waves (GWs) are 'ripples' in space-time caused by extreme processes in the Universe - colliding black holes, merging neutron stars, and supernovae. Their detection led to the 2017 Nobel Prize, which was only made possible by a global effort to construct a network of special GW detectors called LIGO, Virgo, and Kagra. This project aims to develop the next generation of international and Australian detectors to dramatically improve the rate and quality of astrophysical detections, such as observing colliding black holes in the early ages of the universe. This research will not only expand Australia's ability to make iconic astrophysical discoveries, it will also provide commercialisation opportunities for cutting-edge sensing technologies and measurement systems that can benefit the space, defence, and biomedical industries. Examples include the development of new materials for high-speed internet and improved high-power lasers for measuring atmospheric pollution. | | | | | |
| DE230101044 | **Bio-inspired nanomaterials with tunable drug loading and controlled release** | 74,053.00 | 148,106.00 | 148,106.00 | 74,053.00 | 444,318.00 |
| Liu, Dr Yun | This project aims to develop new platform technologies for making bio-inspired nanomaterials with tunable drug loading and controlled release. This project will revolutionise current approaches to make lipid nanoparticles camouflaged with natural cell membranes for delivery of both insoluble and soluble drugs. Significant outcomes will include a novel commercially relevant salt-induced nanoprecipitation platform technology for making precisely engineered nanomaterials with tailored functions for applications in controlled release and targeted delivery. Benefits include securing a sustainable future for Australia, with new nanotechnology strategies for advanced manufacturing. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Many modern drugs do not dissolve easily in water (hydrophobic), limiting their clinical applications. This can be overcome if the drug is delivered in a special biological bubble called a lipid nanoparticle (NP); COVID-19 mRNA vaccines use NP delivery technology. One of the key challenges of using lipid NPs is the limited amount of drug that can be loaded into the NP. This project will engineer bio-degradable lipid NPs with special properties that enable larger amounts of hydrophobic drugs (e.g. anti-cancer drugs) to be loaded into NPs. This technology will significantly improve existing drug delivery methods because it will produce small NPs that can deliver higher doses of drugs to target tissues. Adoption of this NP technology by pharmaceutical companies will enable them to manufacture a wider range of hydrophobic drugs or vaccines that need lipid NPs to get them into the body and reduce symptoms of a disease. | | | | | |
| DE230101081 | **Developing CRISPR Prime Editing for highly efficient precise gene editing** | 76,373.00 | 152,746.00 | 152,746.00 | 76,373.00 | 458,238.00 |
| Adikusuma, Dr Fatwa | This project will further develop a recent breakthrough in gene editing technology named CRISPR prime editing to improve its performance in generating specific genome modifications in cells and organisms. This project expects to generate new knowledge regarding optimal strategies for its deployment as well as create novel enhanced versions of the technology. This would significantly enhance our ability to perform precise genome modification of organisms and lead to substantial benefits for a vast array of applications in fundamental and applied biology. Future applications will include generating mutations in cells and model organisms for basic research and creating genetically enhanced agricultural animals or plants. | | | | | |

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| | **National Interest Test Statement**<br>Genome editing technology is very powerful because it can dictate the phenotypic outcomes of organisms through its ability to modify the genetic code, the genomic DNA. For example, animals can be made bigger or plants can be made resistant to drought by modifying their genome. This project aims to develop novel genome editing technology that could help us to effectively and efficiently create specific genomic DNA modifications. This technology could widely and significantly benefit Australia in many areas through its biological applications. For example, it could help us create better crops or farm animals through genome modification which would potentially generate economic, commercial and environmental benefits for Australia. The resulting technology could also help basic research by providing tools for gene modification to understand the impacts of specific genetic changes in organisms. The technologies will also help scientists generate genetically modified cell, animal, or plant models. The successful invention of the novel technology from this project could translate into patentable products. | | | | | |
| DE230101637<br>Wang, Dr Pengtang | **Heterogeneous Molecular Catalysts for Carbon Dioxide Conversion**<br>This project aims to develop a series of structure-tailored, activity-enhanced and selectivity-oriented heterogeneous molecular catalysts for efficiently converting carbon dioxide (CO2) into value-added fuels and chemicals. Innovations are expected in the rational design and engineering of materials, new mechanistic findings from computation and in-situ characterisation, and breakthroughs in CO2 conversion. Expected outcomes include new synthesis methods, innovative multi-structural engineering strategies, thorough reaction mechanism understanding, and high-performance commercially-relevant CO2 reduction electrolysis. Benefits include a sustainable future for Australia with decreased CO2 emissions and increased green-fuel production. | 73,553.00 | 146,106.00 | 142,106.00 | 69,553.00 | 431,318.00 |
| | **National Interest Test Statement**<br>Conventional use of fossil fuels and industrial production of chemicals consume significant energy and generate huge carbon dioxide (CO2) emissions. This project will develop a new CO2 conversion technology called electroreduction. It will use advanced materials to efficiently convert CO2 into green fuels via renewable electricity, providing an attractive solution for the manufacturing industry to reduce use of fossil fuels and production of CO2. The benefits of this research are a more sustainable future for Australia's manufacturing industries, with decreased CO2 emissions. There will also be commercial opportunities for the renewable energy sector to use this technology to produce green chemicals and fuels such as carbon monoxide, ethanol and ethylene, opening avenues for energy storage and utilization in the future. | | | | | |
| DE230101642<br>Merdith, Dr Andrew S | **Earth's mid-life crisis: recipe for a habitable planet?**<br>This project aims to establish the state and nature of the physical Earth systems (climate, topography, geography, erosion, carbon cycle, oxygen cycle) during the Neoproterozoic Era that made our planet habitable to complex life. By analysing these systems together, fundamental drivers and contributions to making a habitable planet will be untangled. Expected outcomes include the first ever series of climate models of this time period, as well a series of digital reconstructions of the physical systems themselves. Sedimentary hosted ore deposits, such as copper and cobalt, are formed partly as a function of erosion and climate, allowing us to provide a mechanistic driver to their formation, and consequently exploration. | 59,518.50 | 120,856.50 | 119,131.00 | 57,793.00 | 357,299.00 |
| | **National Interest Test Statement**<br>Critical metals such as copper, cobalt and rare earth elements are essential for the energy and transport sectors; they are needed for solar panels, wind turbines, battery storage and electric vehicles. However, critical metals are difficult to locate and retrieve from the earth's crust. Surprisingly, many critical metal accumulations are linked with the evolution of the planet's biosphere, atmosphere and hydrosphere. This project will investigate how the Earth system evolved many years ago to support complex life, to provide oxygen to the air and water, and produce deposits of critical metals so essential for the energy transformation. This research will assist exploration for critical minerals, helping Australia become more self-sufficient in these strategic metals and assist in the global push to decarbonise the economy. | | | | | |
| | **The University of Adelaide** | 717,343.00 | 1,418,905.50 | 1,377,858.00 | 676,295.50 | 4,190,402.00 |

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

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| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| **University of South Australia** | | | | | | |
| DE230100249 | **Enhancing belonging for African diaspora youth in Australian schools** | 79,021.00 | 157,081.00 | 153,060.00 | 75,000.00 | 464,162.00 |
| Baak, Dr Melanie K | Schools are key sites to counter marginalisation and enable belonging. This study will investigate how Black African diaspora youth experience belonging in Australian schools and ways that schools can change practices to enhance belonging. The project will generate new knowledge of belonging and its importance for schooling using innovatory Participatory Action Research with African youth and teachers. Expected outcomes are directions for education policy and practices, development of professional resources for working with diasporic students and capacitating young African people as researchers. Anticipated benefits are improved school engagement, retention and outcomes for African diaspora youth and insights for other marginalised youth. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Over recent decades, Australia's Black African population has grown significantly. Visibly different groups within the community can experience marginalisation in schools and other institutions and this can cause significant challenges to their participation in, and contribution to, Australian society. Australian and international research demonstrates that racial marginalisation inhibits educational, social, cultural and economic outcomes. This study explores how Black African youth experience Australian schooling, and how schools can promote belonging through changes to teaching and learning in schools; teacher education programs; and state and national policies. Importantly, Black African youth will participate as active researchers alongside teachers to identify and trial possibilities for change in curriculum, teaching and professional learning. The study will identify strategies and practices to improve educational and social outcomes for Black African youth, enabling them to work with others in our increasingly diverse Australian society to build social cohesion and cultural inclusion. | | | | | |
| DE230101174 | **Harnessing life-course transitions to optimise time-use behaviour habits** | 73,859.00 | 147,718.00 | 147,718.00 | 73,859.00 | 443,154.00 |
| Dumuid, Dr Dorothea | At every stage of life, how we use our time is one of the greatest determinants of our happiness, productivity, social wellbeing and quality of life. Time-use habits, for better or worse, are entrenched in daily routines that are difficult to break. This project aims to use existing population datasets to identify when during their life people are most likely to change their time-use habits, and to describe who may be at greatest risk of making unfavourable changes (e.g., replacing physical activity with sedentary time, not getting enough sleep). Expected outcomes include new analytical methods to understand time-use routines and new knowledge to inform future time-use improvement strategies to enable Australians to live their best life. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | How people spend their time is a key determinant of their happiness, productivity, and well-being. Our behaviours on how we use our time, known as time-use habits, are entrenched in daily routines that are difficult to change. However, time-use dramatically changes during major life transitions, such as starting high school, joining the workforce for the first time, becoming a parent, or retiring. This project will apply novel mathematical approaches to analyse large population datasets to provide better understanding of the changes in time-use patterns at major life transitions. It will also assist in identifying those at greatest risk for making unfavourable changes during these periods in their life. Recommendations arising from this project will help inform future programs that could assist people to adapt to their new lifestyle demands and to optimise their productivity and their social, physical and mental well-being across various settings, including in schools, workplaces, and in the community. | | | | | |
| | **University of South Australia** | 152,880.00 | 304,799.00 | 300,778.00 | 148,859.00 | 907,316.00 |
| | **South Australia** | 870,223.00 | 1,723,704.50 | 1,678,636.00 | 825,154.50 | 5,097,718.00 |

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| **Tasmania** | | | | | | |
| **University of Tasmania** | | | | | | |
| DE230100992 | **A novel epigenetic clock tool to conserve Australia's threatened seabirds** | 73,956.00 | 148,802.00 | 139,152.00 | 64,306.00 | 426,216.00 |
| Roman, Dr Lauren T | The aim is to develop a novel epigenetic technique for the demographic assessment of long-lived seabirds, including albatrosses and petrels, for application to the conservation of 11 threatened species breeding across Australia. A major innovation will be an affordable and fieldwork-friendly technique to demographically fingerprint any population, ending the large amount of guesswork currently necessary in management. The outcome is expected to enable (i) scientists and wildlife managers to impute the impact of threats and management activities on seabird populations, allowing quantitative scenario modelling, and (ii) stakeholders to analyse numerous threats and optimise management responses to these through research-based decision-making. | | | | | |
| | **National Interest Test Statement**<br>Under international conservation agreements, Australia is responsible for the protection of threatened species. Albatrosses and petrels are an example of threatened species in Australia that are also important for global conservation efforts. To protect these species effectively, we need data, such as age and sex (i.e. demographics), of populations of these species. Getting this type of data in the past required years of expensive fieldwork. This project will deliver a new rapid, cost-effective technique to get this data. This data will be obtained from DNA from a single drop of blood. This data will be used to identify threats to seabird conservation and improve our ability to forecast the success of conservation actions. This new technique is a world first and will position Australia as a global leader in conservation of threatened species. As well as providing a cost-effective technique for specifically protecting Australian and globally important seabirds, this new technique could also be used for protecting other threatened species. | | | | | |
| | **University of Tasmania** | 73,956.00 | 148,802.00 | 139,152.00 | 64,306.00 | 426,216.00 |
| | **Tasmania** | 73,956.00 | 148,802.00 | 139,152.00 | 64,306.00 | 426,216.00 |

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| **Victoria** | | | | | | |
| **Deakin University** | | | | | | |
| DE230100176 | **Muslim Museums: Curating Islam in Multicultural Societies** | 55,598.00 | 122,041.00 | 139,235.00 | 72,792.00 | 389,666.00 |
| Rey, Dr Virginie C | This project aims to determine how contemporary Muslim communities use museums as a medium to think about and display their collective identities in non-Muslim-majority societies. Drawing on a comparative ethnographic study of Muslim-led museums across Australia, Europe, and North America, the project expects to generate new knowledge about how Muslim communities collect, curate, and exhibit their heritage in a comparative frame. Outcomes include the first transnational study of Muslim museums and a radio documentary on the Islamic Museum of Australia. Anticipated benefits include a greater understanding of the experiences of communities in caring for their heritage and improved competency in displaying multicultural heritage in museums. | | | | | |
| | **National Interest Test Statement**<br>In 2021, 80% of Australian Muslims reported experiencing unfavourable treatment, feeling marginalised and/or misrepresented. This is happening at a time when the Muslim population of Australia is growing in the face of displacements due to war and ongoing geopolitical shifts in Muslim-dominant regions of North Africa, the Middle East and neighbouring Southeast Asia. For migrant/diasporic communities in Australia, developing museums has played a major role in their sense of community-building, self-affirmation and integration. Through engaged fieldwork with Muslim-operated museums across Europe, North America and Australia, this project will develop novel ways of understanding the experiences of Muslim communities in curating and promoting their historical and cultural heritage in a challenging period. In elevating community voices, the project will have various benefits for Australian society, including improving collaborations between communities and public museums and providing research on multiculturalism that may inform future government policies. | | | | | |
| DE230100338 | **Enabling solid state metal recycling with new numerical techniques** | 74,364.00 | 148,846.50 | 149,996.50 | 75,514.00 | 448,721.00 |
| de Vaucorbeil, Dr Alban G | This project performs modelling to help develop an additive metal manufacturing process that makes use of scrap as input feed. It will develop new understanding of the key physical aspects of friction stir additive manufacturing and build a new efficient yet accurate continuum thermo-mechanical model for its simulation. This technology will enable metal deposition at rates an order of magnitude greater than conventional powder additive manufacturing methods. The new computational approach will be used to create processing and design maps. The work will facilitate greater use of high metal scrap and pave the way for more robust supply chains and new business models with application in automotive, mining, aerospace and military sectors. | | | | | |
| | **National Interest Test Statement**<br>Recycled scrap metal has potential to be a sustainable and low-cost source of high value, scarce manufacturing materials for Australian manufacturing. Currently most metal recycling process's require high energy inputs and are negatively impacted by even minor contamination. Using new modelling tools, my project will create a novel avenue for low energy, efficient recycling of high value scrap metals. This will enable cost-effective use of a new 3D printing technology, Additive Friction Stir Deposition (AFSD) in low environmental impact recycling, to produce high quality, large metallic parts without melting the input materials, with greater tolerance of impurities in scrap feedstock. Benefits include a low energy Australian made recycling process that enables a broader range of feedstock to be processed, to be used for advanced manufacturing products across many of the national manufacturing priority sectors. Greater use of high value metal scrap locally will pave the way for more robust supply chains and new business models with application in our mobility, mining, aerospace, and defence sectors. | | | | | |
| DE230100652 | **Toward data justice in Australian schools** | 67,000.00 | 141,250.00 | 136,750.00 | 62,500.00 | 407,500.00 |
| Pangrazio, Dr Luci J | This project will investigate the challenges raised by digital data for Australian schools. The use of digital technologies in schools has led to systematic data collection, which reconfigures schooling processes and interpersonal relationships and presents new risks to staff and students. Although there are laws in place to protect students' rights, there are hidden consequences to using digital technologies. This research project investigates how data collection, use and disclosure is experienced and understood in schools. It will identify the role played by intermediaries, such as tech brokers, educational authorities and professional networks. Benefits include policy recommendations, protocols and guidelines for data justice in schools. | | | | | |

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| | **National Interest Test Statement**<br>This project will raise datafication as a significant issue in Australian schools. It will provide detailed, fine-grained analysis of how data circulates within and beyond schools and investigate the implications this has on young people's learning and development. The project will have practical, educational and research benefits. For school staff, it will increase understanding of data generation, processing and feedback and provide them with a list of strategies to help procure digital technologies and ensure their data practices are just. Through a series of collaborative workshops between school staff and other key stakeholders in the tech industry and education, it will develop protocols, guidelines and policy recommendations on just data use in schools. As the main beneficiaries of this project, young people should have greater privacy and a more equitable schooling experience as a consequence of this study. | | | | | |
| DE230100901<br>Baynes-Rock, Dr Marcus | **Narrating the Roles of Animals in Cultural Burning**<br>This research aims to produce knowledge of the ways in which humans and animals co-construct landscapes via the medium of cultural burning. It will be the first multispecies ethnography of people and animals on Native Title land engaged in landscape modification based on the use of cultural fire. Taking its lead from Indigenous partners this research will develop narratives of how humans, and animals co-construct landscapes via the medium of fire within wider socio-ecological frameworks. These narratives will inform policy and practice with regard to forest management, protection of species, conservation management, bushfire mitigation, promotion of biodiversity, and Indigenous health. | 70,000.00 | 142,500.00 | 140,000.00 | 67,500.00 | 420,000.00 |
| | **National Interest Test Statement**<br>This research is in the national interest in that it seeks to mitigate bushfire risk by generating knowledge of how people and animals create more resilient landscapes that are less prone to intense fire. It will also generate better conservation outcomes for native flora and fauna via the production of knowledge of how cultural burning affects and is affected by people, animals and wider socio-ecological processes. This knowledge will inform policy and practice in terms of forest management, protection of species, conservation management, bushfire mitigation, promotion of biodiversity, and Indigenous health. Lastly, this research will amplify Indigenous voices in land management practice and policy by adopting Indigenous-led research questions and aims, and engaging with Indigenous researchers from Australia and overseas. | | | | | |
| DE230101371<br>Cai, Dr Qiran | **Boron nitride nanosheets for low energy consumption self-cooling devices**<br>This project aims to investigate the thermal transport mechanism of strained two-dimensional materials for self-cooling thermal management. It expects to generate new knowledge about their unique thermal properties, guiding the use of waste heat generated in electronics for self-cooling. Expected outcomes include a novel energy-effective thermal management strategy and enhanced capacity to engineer thermal transport in two-dimensional materials that will be deployed in miniaturised and high-density electronics to overcome overheating problems. This will provide significant benefits to the economy and the environment, such as reduced cost, energy consumption and CO2 emissions in thermal management technologies. | 75,502.50 | 152,221.00 | 154,293.50 | 77,575.00 | 459,592.00 |
| | **National Interest Test Statement**<br>Australian data centres consume about 3.5% of Australia's total electricity consumption, and emit as much CO2 as the commercial airline industry and are growing rapidly. Almost half of that energy is used to cool the advanced computing infrastructure. To reduce energy consumption for cooling, this project will develop novel nanomaterials and much more effective ways to dissipate "waste heat", by controlling the operating temperature of electronic devices. These nanomaterials automatically respond to temperature changes in electronic devices and use the resulting "waste heat" for self-cooling, so additional energy to cool the devices is not needed. These novel nanomaterials and thermal management system will be patented and commercialised with local industries. This energy efficient thermal management strategy will overcome common overheating problems of widespread electronic devices, increase device safety, reduce energy consumption and CO2 emissions, and contribute to Australia's 2050 net zero emissions goals as well as globally. | | | | | |

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| DE230101380 | **Exploring the digital divide in the ageing migrant's personal home** | 69,053.00 | 139,053.00 | 135,000.00 | 65,000.00 | 408,106.00 |
| Cabalquinto, Dr Earvin C | This project aims to investigate the experiences of ageing migrants in accessing and using digital communication technologies in their personal home settings. Taking the case of elderly Filipino-Australians, and deploying multi-sited ethnography and visual methods, this project expects to generate new knowledge on the consequences of digital divide on their personal and social wellbeing. Expected outcomes include culturally appropriate recommendations and resource materials to determine and reduce communication barriers for ageing migrants, migrant communities, policy makers, and relevant stakeholders. This should provide significant benefits in enhancing ageing migrants' connective capacities to navigate a secure digital landscape. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australia has a large ageing migrant population embedded within a rapidly evolving digital society. The Australian Government has invested in digital inclusion programs to enhance the digital skills and competencies of this cohort. However, ageing migrants continue to encounter difficulties in navigating digital environments. This project will provide insights to better understand the benefits and challenges experienced and negotiated by ageing migrants in using digital media technologies. Unlike previous research it will centre on ageing migrants' personal homes as a site of investigation. The home is a vital space for shaping everyday personal, familial, and social lives. This project will establish a valuable foundation for ageing migrants, migrant communities, policy makers, and relevant stakeholders. It will produce culturally appropriate measures and resource materials to improve ageing migrants' connective competencies. In turn, this should enhance their personal and social wellbeing by helping activate an inclusive, secure, and age-friendly digital society. | | | | | |
| DE230101472 | **Converting textiles waste to novel nanostructured porous carbon fibre** | 74,859.00 | 150,668.00 | 152,168.00 | 76,359.00 | 454,054.00 |
| Li, Dr Quanxiang | This project aims to develop innovative catalytic activation approaches for converting textiles waste to porous activated carbon fibre with potential application in energy storage and carbon capture. The project expects to address the key issue of textile upcycling and generate new knowledge in material science by revealing the principle of alkali metal-induced pore formation and carbon dot synthesis. Expected outcomes include advanced techniques to create value-added materials from recycling textiles waste and in-depth understanding of performance improvement mechanisms. Success will provide significant benefits in securing a sustainable future for Australia, ensuring valuable resources recovery and strategies for advanced manufacturing. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australia generates huge amounts of textile waste annually, of which only 7% is recycled, the remainder sent to landfill. The major barrier to textile recycling is the complex mix of materials found in clothing. This project will create a new recycling technology able to transform discarded clothing into valuable carbon materials that can be used to make high value clean energy products, such as Li-ion batteries, hydrogen fuel cells and greenhouse gas absorbents. This project will develop novel chemical conversion models, to transform polyester/cotton blends into flexible, lightweight and multifunctional porous carbon fibres. This innovative textile recycling will eliminate the energy-demanding, complicated separation steps of conventional methods, improve the yield of value-added materials, and reduce landfill and carbon emissions. The outcomes will help address the globally critical challenge of upcycling problematic clothing waste, and contribute to Australia becoming a world leader in textile circularity. | | | | | |
| DE230101646 | **Regulating predictive technologies for preventive counterterrorism** | 72,391.00 | 149,378.50 | 150,905.50 | 73,918.00 | 446,593.00 |
| Krebs, A/Prof Shiri | This project aims to improve the legal regulation of predictive technologies for preventive counterterrorism measures. The project expects to generate new knowledge in counterterrorism law and policy using doctrinal, comparative, and empirical methods. In particular, the project collects data on the United Nations Security Council's resolutions mandating collection, sharing, and use of predictive technologies to strengthen global counterterrorism, and examines how these resolutions influence security and human rights in Australia and its security partners. Expected outcomes include recommendations for improving the laws governing the use of predictive technologies and strengthening security, individuals' human rights, and the rule of law. | | | | | |

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| | **National Interest Test Statement**<br>This will be the first large-scale empirical study of the legal regulation of predictive technologies (including artificial intelligence) in preventive counterterrorism processes. The project will maximise its impact on policy through a structured consultation process with academics and professionals in Australia and internationally, including events and publications tailored to diverse audiences. The project will provide evidence on the predictive turn in global counterterrorism, identify existing weaknesses in its regulation, and propose ways to improve it, strengthening Australia's leadership in this area. The interdisciplinary and comparative framework will offer globally relevant findings to inform critical counterterrorism processes, enhancing international and national security and mitigating risk to civilians through improved regulation. The findings will further inform policies in other areas of domestic law, like policing and immigration control, which also rely on predictive technologies. The mounting reliance on predictive technologies makes this inquiry particularly important and urgent. | | | | | |
| | **Deakin University** | 558,767.50 | 1,145,958.00 | 1,158,348.50 | 571,158.00 | 3,434,232.00 |
| **La Trobe University** | | | | | | |
| DE230100659<br>Riordan, Dr Benjamin C | **The prevalence and impact of digital alcohol exposure**<br>This project aims to use artificial intelligence to quantify the amount of alcohol people are exposed to in digital media (e.g., social media, streaming videos) in their daily lives and the effect alcohol exposure has on alcohol use. Expected outcomes for this project include a quantification of the amount of alcohol exposure in digital media and the impact it has on drinking and a development of a protocol to test exposure. Significant benefits are expected for policy makers aiming to reduce exposure and the public wanting to avoid exposure to limit the harm of alcohol. | 78,232.00 | 157,285.00 | 148,976.50 | 69,923.50 | 454,417.00 |
| | **National Interest Test Statement**<br>By applying artificial intelligence algorithms to a research area previously dominated by self-reporting methods, this study will generate rich new knowledge about how much alcohol people are exposed to in digital media, and the true impact of that exposure. This study will increase the much needed public's awareness about alcohol exposure and lead to tools to help reducing that exposure. The study aligns with the government's practical challenge in Health to implement "effective technologies for individuals to manage their own health care". Given that alcohol is estimated to cause $15B costs per year to Australian society, this study has the potential to have a significant health and economic impact by informing policy and creating change. Finally, it will provide a blueprint for how to quantify and reduce the effect of exposure for other products that can cause societal harm such as sugary drinks, fast food and tobacco. | | | | | |
| DE230100889<br>Libourel, Dr Paul-Antoine | **Do predators shape the sleep of their prey?**<br>This project aims to investigate how sleep is affected by fear/stress by studying invasive and native rat species, historically exposed to different predation pressures. It expects to generate new knowledge in biological and health sciences, also helping controlling pests. This unprecedented approach to studying sleep will provide key insights on the environmental and genetic determinants of sleep, allowing us to better understand sleep, its expression and flexibility, and response to stress. More than providing fundamental answers on the evolution of sleep, this project will provide significant benefits such as new perspectives on invasive species management, and may also reveal new targets for treatments to stress related sleep disorders. | 79,053.00 | 151,801.00 | 134,246.00 | 61,498.00 | 426,598.00 |
| | **National Interest Test Statement**<br>Sleep is essential for all animals, but disruptions to sleep caused by stress and by environmental change are having major impacts on the health of humans and animals. For humans, stress-induced sleep disturbances are characteristic of many mental health disorders, for example depression, anxiety and post-traumatic stress disorder (PTSD). These cost Australia's economy $14.4B per year in lost work. In animals, the stress induced by predators on prey can interfere with normal sleep patterns which then affects reproduction, feeding and care of young, and may contribute significantly to the loss of endangered native species. In this project we will use new technology to study sleep in wild animals for the first time, to gain a better understanding of the impact of stress on sleep. Results will be shared with scientists, ecologists, clinicians, and government advisors and have the potential to shape both the treatment for stress-related sleep disorders and the design of conservation programs, benefiting the heath of Australia's human population and unique ecosystem. | | | | | |

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| DE230101123 | **Supporting the inclusion of siblings when a family is in crisis** | 62,500.00 | 125,000.00 | 125,000.00 | 62,500.00 | 375,000.00 |
| Butler, Dr Ashleigh E | This project aims to explore the inclusion experience of siblings during a significant family crisis – a child's critical illness. Exclusion from a family crisis can have lasting impacts, however sibling experiences of inclusion when a child is critically ill remain unstudied. Through observation and interviews with children and their families, this project expects to generate new knowledge about sibling inclusion in this family crisis. Expected outcomes include guidelines to enhance sibling inclusion and a resource to support family togetherness. This project should provide significant social benefits, such as changes to local and national sibling and family policies, and improved family wellbeing for all Australian families in crisis. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Children depend on inclusion in their family to maintain their sense of wellbeing and security. When a family is in crisis, this sense of security can be displaced, with significant impacts on child and family wellbeing. This is particularly true if children are excluded from a crisis experience, as often occurs when a brother or sister is critically ill. Each year, 8,600 Australian families have this experience. There is currently no understand of siblings' experiences, needs, and support during this crisis. This project is the first in the world to address this urgent social issue by exploring the siblings' experiences of this significant family crisis from the viewpoints of children, and their parents / carers. Evidence-based resources will be developed to support sibling inclusion and will provide foundational knowledge to enhance the inclusivity of service delivery for all Australian families in crisis. Improving the support for siblings will ensure family wellbeing and security is maintained during this critical period in life for many Australian families. | | | | | |
| DE230101636 | **New knowledge on internalised prejudice for same-sex attracted Australians** | 70,500.50 | 141,099.50 | 137,997.00 | 67,398.00 | 416,995.00 |
| Anderson, Dr Joel R | This project aims to conduct the first nation-wide investigation of internalised sexual prejudice – a key factor driving the health and well-being disparities experienced by same-sex attracted Australians. The project expects to generate new knowledge around the internalisation of past experiences of sexual prejudice. Expected outcomes include advanced measurement techniques of conscious and non-conscious prejudice, significant advances in understandings of the causes and consequences of internalised sexual prejudice, and an enhanced capacity for international collaborations. This should provide significant benefits for same-sex attracted Australians, and for the health, government, and community support sectors working with them. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Same-sex attracted Australians experience stigma and discrimination which directly contribute to chronic stress, with significant negative outcomes. It is evident that other people's words and attitudes do cause harm through a process of taking in or internalising stigmatisation. A recent national survey of same-sex attracted Australians reported that 32% of respondents met the criteria for clinical anxiety, 24% for a major depressive episode, 33% had self-harmed, and 16% had attempted suicide. However, the exact pathway from stigma to harmful outcomes is poorly understood and hard to quantify. There is a need for research establishing the key factors driving internalised discrimination in order for mental health clinicians to effectively support this group. This project will deliver a comprehensive national evidence base and psychological tools which policymakers and health practitioners can use to design, deploy and evaluate more effective responses, potentially reducing the burden on Australia's healthcare system. | | | | | |
| | **La Trobe University** | 290,285.50 | 575,185.50 | 546,219.50 | 261,319.50 | 1,673,010.00 |
| **Monash University** | | | | | | |
| DE230100029 | **Variational Inference for Intractable and Misspecified State Space Models** | 54,053.00 | 113,946.50 | 118,545.50 | 58,652.00 | 345,197.00 |
| Loaiza-Maya, Dr Ruben A | State space models (SSMs) are popularly used to model economic variables such as inflation and financial volatility. Variational inference is a technique that allows for fast implementation of SSMs, but whose properties are yet to be understood. This project aims to study the properties of variational inference for SSMs used in economics. This research will develop new variational inference techniques to improve inferential and predictive accuracy from SSMs. An expected implication of this project is that it will expand the ability of economic institutions to employ larger SSMs, which will allow for more accurate models for economic variables. This will provide significant social benefits by leading to better informed economic policy. | | | | | |

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| | **National Interest Test Statement**<br>Important economic institutions such as The Reserve Bank of Australia, employ complex economic models (that have thousands of parameters and millions of data points) to produce predictions of key economic variables and subsequently help them inform economic policy. This project will develop faster statistical methods to estimate the parameters of these complex economic models. The project will also investigate the properties of these new methods and assess their accuracy with the goal of producing faster and more precise predictions. The advances from this project will provide new methods to produce faster and more accurate predictions of key economic variables, such as inflation and economic growth. This will provide institutions, such as the Reserve Bank, with a new tool for the design of effective fiscal and monetary policy that will generate benefit for all Australians. | | | | | |
| DE230100046<br>Wang, Dr Hao | **Reliable Integration of Distributed Low-Carbon Energy Resources**<br>This project aims to generate new knowledge that will facilitate the integration of low-carbon distributed energy resources into electricity grids. This project expects to advance the theory, algorithms, and methods in the area of smart grids using innovative approaches of optimisation and data analytics. Expected outcomes of this project include novel algorithms and tools to enable the reliable integration of low-carbon distributed energy resources and unlock their value in electricity grids. This should provide significant benefits, such as affordable electricity for Australian consumers, improvements in the reliability of grids in Australia, and increased and more effective use of sustainable energy for emission reduction. | 73,759.00 | 149,368.00 | 145,968.00 | 70,359.00 | 439,454.00 |
| | **National Interest Test Statement**<br>This project aims to generate new knowledge that will improve the reliability of renewable electricity and accelerate the integration of household-produced energy into the electricity grid. By designing and modelling new smart electricity grids, this project will better integrate and utilise Australia's distributed energy resources, such as rooftop solar panels and electric vehicles. With new models of how Australians use energy, this project will produce better tools and software to manage energy production and use. As the Australian electricity market moves away from fossil fuels, this project will unlock financial rewards to households providing energy directly into the grid from household energy generation and enable Australians to enjoy cheaper and more reliable electricity while ensuring the Australian electricity grids remain secure. By highlighting new energy and financial incentives to Australians, the project will also facilitate faster adoption of distributed renewable energy resources and play an important role in meeting Australia's long-term carbon emission reduction goals. | | | | | |
| DE230100049<br>Stefanov, Dr Kalin | **Towards automated Australian Sign Language translation**<br>This project aims to address the computational modelling of Auslan. The project expects to generate knowledge by creating the largest Auslan dataset, enabling further advancements in this research area. The dataset will also play an essential role in other research fields, e.g., sign linguistics. Expected outcomes include the invention of the first Auslan recogniser and generator capable of distinguishing and synthesising 1000+ signs, representing a substantial advancement towards fully automated Auslan translation. This should provide significant benefits for the Australian Deaf community, such as high-quality digital systems for education and communication, resulting in increased quality of life and inclusion in the Australian society. | 74,500.00 | 151,837.50 | 155,015.00 | 77,677.50 | 459,030.00 |
| | **National Interest Test Statement**<br>The COVID-19 pandemic has highlighted that many Australians use Australian Sign Language (Auslan) to communicate and need qualified interpreters. This project aims to develop technologies for the recognition and generation of Auslan, making significant progress toward fully automated Auslan translation. The project will address some of the practical challenges outlined in the Australian Government's National Disability Strategy and Roadmap for Hearing Health. The Australian Deaf community will benefit from high-quality applications for enhanced education and communication, resulting in increased quality of life and inclusion in society. An anticipated use of the research in education of the developed technologies is a smartphone and computer-based applications for sign language skill acquisition and practice. The project will also build the foundations for use of the technologies in more advanced communication instances, including cheap and effective real-time, on-screen spoken language translation during newscasts and emergency broadcasts. | | | | | |

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| DE230100056 | **Accurate Fault Location Methods for Complex Power Networks** | 68,359.00 | 136,718.00 | 136,718.00 | 68,359.00 | 410,154.00 |
| Razzaghi, Dr Reza | This project aims to devise novel algorithms to tackle one of the longstanding and challenging problems in power networks; finding the fault location in power lines. Recent bushfire preventive technologies that have been installed in power networks make the fault location process extremely challenging and time-consuming, leaving communities without power for many hours in extreme heatwave conditions. The intended outcomes of the project are innovative algorithms that are able to pinpoint the fault location more accurately in complex networks, with many fewer measurement devices than conventional methods. This is expected to provide significant benefits for public safety and power supply reliability. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Electricity networks in Australia are vulnerable to power outages, which can be triggered by faulty equipment, falling trees, bushfires and storms. These outages can be long-lasting, especially where the source of the fault is hard to find, and cost the Australian economy billions of dollars every year. This project will address the problem of finding the fault location in power lines much faster, and more precisely, than current methods. The knowledge gained and theoretical advances in the project form a crucial step in developing commercial products to pinpoint power faults at scale in real electricity networks, specifically in the Australian context. The outcomes of the project will enable early detection of faults, shorter power outages and more resilient electrical networks. | | | | | |
| DE230100183 | **Understanding the birth of new elements by observing dying stars** | 63,303.50 | 127,664.00 | 125,411.00 | 61,050.50 | 377,429.00 |
| Danilovich, Dr Taissa | Almost everything around us is made up of elements that were created inside stars. This project aims to understand the origin of the elements by studying newly created material ejected by Sun-like stars during one of the final stages of their lives. This project expects to generate new knowledge in the field of stellar evolution by using state-of-the-art telescopes to measure the elements and isotopes produced by these stars and comparing them with theoretical model predictions. Expected outcomes include a better understanding of element creation, the chemical enrichment of galaxies, and the first mass estimates for intermediate-mass stars. This should provide significant benefits by addressing a key outstanding question in astronomy. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Almost every element in the world around us was created by a star. This discovery-based project seeks to better understand this process and the role played by stars like our Sun. By studying the elements created by dying Sun-like stars, this project will help us understand more about how elements are produced and recycled into new stars and planets. This is one of the key priorities of the Decadal Plan for Australian Astronomy 2016–2025. This project will link Australian science with key global questions about the origins and fate of the universe, renew important links to the European Southern Observatory and build international collaborations. The project will also develop new skills and capacity in computation, programming and data analysis that are highly-prized in the new big-data economy and the space industry sector, which will help inspire young Australians to pursue careers in science and technology. | | | | | |
| DE230100356 | **Bacterial membrane remodelling and the interaction with peptides** | 76,548.50 | 150,226.00 | 148,572.00 | 74,894.50 | 450,241.00 |
| Han, Dr Meiling | This project aims to elucidate the fundamental mechanism of lipid remodelling in Gram-negative outer membrane, which is critical both in preventing noxious compounds and evading host immune defence. For the first time, the complex interplays between bacterial cellular metabolism and membrane remodelling will be defined through systems pharmacology, and the precise membrane-peptide interaction will be examined by computational and biophysical approaches. Novel knowledge will be generated to improve our understanding on how bacteria remodel their outer membrane in response to environmental stress. This will benefit the future design of much-needed antimicrobial strategies including products and technologies to target bacterial membrane. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | One major group of bacteria, the Gram-negative bacteria, have posed a serious threat to human and animal health worldwide. The properties of their unique outer surface make them extremely resistant to many antibiotics. However, there is a lack of understanding on how bacteria modify their cell surface to resist antibiotics. Hence, this project aims to study the precise composition of the outer surface of Gram-negative bacteria and understand how the surface adjusts to and protects against noxious chemicals in the environment. Findings from this research will uncover new targets for medicines and antibiotics to fight these bacteria and this will be pursued through productive academic-industry collaborations. This research will therefore lay the groundwork to benefit Australia’s antimicrobial biotechnology sector. | | | | | |

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| DE230100400 | **Fallopian tube on-a-chip for understanding mammalian reproduction** | 72,375.50 | 142,678.50 | 140,606.00 | 70,303.00 | 425,963.00 |
| Nosrati, Dr Reza | This project aims to reveal the fundamental physics and biology of mammalian reproduction by engineering the first comprehensive 3D culture model of the fallopian tube. The project expects to generate significant new knowledge about the exact role of the fallopian tube anatomy and physiology on the formation and function of epithelial tissue, using innovative approaches to simultaneously measure the full dynamics of epithelial cell activity and sperm motion. The expected outcome of the project is to reveal the cooperative role of sperm, egg and epithelial tissue on fertilisation. This should provide significant benefits, such as important biophysical insights into mammalian reproduction and new research tools to replace animal models. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This research will deliver ground-breaking insights into mammalian reproduction by developing the first 3D culture models of the fallopian tube to directly study the event of fertilisation. The project outcomes create novel cell culture and analysis technologies that will benefit researchers in biomedical engineering and cell biology, by providing new tools to directly study cell behaviour and cell-cell interactions in physiologically relevant environments, leading to commercialisation opportunities. These made-in-Australia technologies, in long-term, have the future potential to improve the prevention and management of human health by revealing unknown causes of infertility. Whilst this later application is well beyond the scope of this project, the potential socioeconomic benefit is significant as infertility affects 186 million individuals worldwide and 1 in 6 couples in Australia, with $220 million in Medicare benefits covered by the Australian Government for assisted reproduction in 2019. | | | | | |
| DE230100407 | **Novel Hydroxide Ion Conductive Membranes for Advanced Ammonia Fuel Cell** | 78,759.00 | 156,723.00 | 152,448.00 | 74,484.00 | 462,414.00 |
| Lu, Dr Jun | This project aims to address a longstanding challenge in the development of direct ammonia fuel cells for utilization of ammonia as a green energy carrier. It proposes to develop advanced hydroxide ion conductive membranes based on novel porous framework materials to achieve high hydroxide ion conductivity and lower ammonia crossover simultaneously, thereby substantially enhancing the energy efficiency of direct ammonia fuel cells. The proposed research expects to create new knowledge in the fields of membrane science and energy. The successful development of advanced membranes will improve the efficiency of storage of intermittent and fluctuating renewable resources, thereby contributing to the reduction of carbon footprint in Australia. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australia is blessed with abundant renewable energy sources, and advanced technologies need to be developed to utilize the renewables efficiently and cheaply. Ammonia has been identified as a promising energy carrier to store renewable solar and wind energy and power electric vehicles as it can be readily produced from renewable energy and easily transported. This project aims to develop a new ammonia fuel cell to generate electricity directly from ammonia much more efficiently than current methods, based on a unique membrane technology. The research expects to create a unique opportunity for Australian energy and advanced manufacturing sectors and place Australia at the forefront of research in advanced membranes, fuel cells and renewable energy. The project focusses on a core technology needed for future use of ammonia for electricity generation and the knowledge gained can therefore add immediate value to Australian businesses which are commercialising complementary technologies in ammonia and hydrogen production. | | | | | |
| DE230100498 | **Mapping the genetics of brain connectivity** | 77,128.00 | 152,031.00 | 149,806.00 | 74,903.00 | 453,868.00 |
| Arnatkeviciute, Dr Aurina | The brain is a complex biological system that gives rise to our consciousness, thoughts, and experiences, yet we still do not know how this complexity emerges. This project aims to comprehensively investigate the genetics of brain connectivity combining cutting-edge techniques in neuroimaging, genomics, mathematical modelling, and cognitive neuroscience, focusing specifically on the connectivity of functionally important brain network hubs. The outcomes will provide a mechanistic understanding of the genetic origins of brain network formation and an explanation for how genetic influences on brain organisation shape human behaviour advancing the fundamental knowledge about the complexity of the brain. | | | | | |

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| | **National Interest Test Statement**<br>The brain is an extraordinarily complex network with more than 100 trillion connections. Critically, this network is organized in different ways in different people, forming a biological basis for what makes us unique as individuals. This project will use a combination of neuroscience, genetics, and mathematical models to better understand the biology of individual differences in behaviour, and to identify how genes shape these differences. The results will help us understand why we are all unique, and provide an evidence base to guide efforts to develop personally-tailored strategies for optimizing development, ageing, and combatting brain disease. The insights from the project may also ultimately help with understanding developmental brain connectivity disorders, such as schizophrenia, bipolar, and autism. | | | | | |
| DE230100542<br>Lappan, Dr Rachael J | **Microbial life in the atmosphere**<br>This project aims to resolve the nature and basis of microbial life in the atmosphere, the largest but most unexplored potential ecosystem on Earth. The atmosphere plays a role in transporting microbes, but our understanding of resident atmospheric microbial communities and their role in global atmospheric processes is minimal. Using cutting-edge molecular and biogeochemical approaches, this project aims to identify true microbial residents of the atmosphere, understand their mechanisms for survival in this environment and explore their role in seeding newly formed environments. The anticipated outcomes include fundamental knowledge on atmospheric microbial ecosystems, and their influence on global atmospheric processes. | 73,876.50 | 148,870.50 | 153,494.00 | 78,500.00 | 454,741.00 |
| | **National Interest Test Statement**<br>Microbes are present almost everywhere on Earth: on land, in water and in the atmosphere. Even though the atmosphere is vital for life on Earth, its microbial life is the least understood. This project seeks to generate new knowledge about microbial communities in the atmosphere, including how they adapt to survive in this extreme environment, how they regulate the atmosphere, and how they shape new ecosystems on land. This improved understanding will increase Australia's capacity to predict how land environments will adapt to rapid changes in climate and how new environments are colonised by microbes. Understanding atmospheric microbial ecosystems therefore has wider implications for environmental and public health. Insights and tools developed in this research may also inform future research on life in other extreme environments and where life can be hard to find (e.g. deserts). | | | | | |
| DE230100700<br>Stubenrauch, Dr Christopher J | **A novel bacterial secretion system for applications in nanobiotechnology**<br>This project aims to characterise a new molecular machine, called the S-Pump. Molecular machines drive the complex biology in all cells and are an exciting area of translational research, with broad potential for industrial applications. This project expects to provide fundamental insights into how bacterial S-Pumps contribute to antimicrobial resistance and enhancing food production. Expected outcomes include new tools for molecular machine discovery and identification of ways to adapt molecular machines for biotechnological applications. This work should enhance Australia-UK ties through collaboration, provide benefits toward nanobiotechnology and economic benefits through more efficient food production. | 71,868.50 | 144,071.50 | 142,856.00 | 70,653.00 | 429,449.00 |
| | **National Interest Test Statement**<br>Some bacteria cause disease in animals and plants, yet others are beneficial. This is because bacteria can pump out different chemicals: some toxic and some protective. Recently, a new type of pump was found in both harmful and beneficial bacteria. This project aims to increase our understanding of this new pump, including how it works and what chemicals it releases. Doing so will allow us to devise strategies to turn these pumps off in harmful bacteria and speed them up in beneficial bacteria. New knowledge of these bacterial pumps would allow engineers and industry partners to harness their properties, paving the way for many applications. For example, some beneficial bacteria pump out toxins that kill fungi. These fungi devastate the wheat and corn industry, so manipulating these pumps could enable methods to protect our food supply. | | | | | |
| DE230100704<br>Hill, Dr Briony L | **Reframing knowledge of preconception lifestyles: A socioecological approach**<br>This project aims to reframe our understanding of women's preconception lifestyle health using a novel, socioecological approach. This project expects to generate new knowledge on societal views of weight stigma for preconception women and identify policy stakeholders' views on integrating preconception into healthy lifestyle policies. Expected outcomes of this project include a new theory- and evidence-informed conceptual model for preconception lifestyle health that transcends the current focus on personal responsibility. This should provide significant benefits, such as informing policy to drive systems changes around preconception lifestyle health with concomitant cultural benefits to Australians, leading to improved population health. | 67,780.00 | 145,518.00 | 145,628.00 | 67,890.00 | 426,816.00 |

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| | **National Interest Test Statement**<br>Women at a healthy weight who are seeking to become pregnant have better outcomes during pregnancy and beyond. However, the medical and social focus on body size and weight gain creates weight stigma. Weight stigma can have negative effects before, during and after pregnancy. For example, stigmatising encounters with healthcare professionals exacerbate feelings of blame and discrimination among women planning pregnancy. This project seeks to understand how social, cultural and environmental factors, such as community beliefs around weight stigma, workplace environments, and the media, influence weight stigma in preconception women. The project will develop a new model for preconception lifestyle health that identifies opportunities to reduce weight stigma and blame. Knowledge gained will inform the development of preconception practice guidelines; policies for workplaces, healthcare, and populations; and intervention programs. These new approaches will address social and cultural influences of preconception care, reduce weight stigma, and support preconception women's lifestyle health. | | | | | |
| DE230100730<br>Trauer, A/Prof James M | **Strategies to minimise the societal impacts of zoonotic pandemics**<br>The continuing pandemic has had unprecedented effects across society. Population mobility restrictions have been effective in slowing transmission, but are only effective while in place and have dramatic adverse effects. Despite Australia's relative success, we have lacked a clear national strategy to guide the optimal deployment of such restrictions. During this fellowship, I will use robust software development practices to develop a unified software platform that integrates semi-mechanistic, particle filter and agent-based methodologies. I will then use this platform to quantify the effects of mobility restrictions and define the optimal strategic response that should be selected based on the characteristics of a newly emerged pathogen. | 72,000.00 | 148,000.00 | 152,000.00 | 76,000.00 | 448,000.00 |
| | **National Interest Test Statement**<br>As the world's population and our global connectedness steadily increase, another severe pandemic becomes increasingly likely. The overarching goal of this project is to define the most effective response strategy for an emerging infection with pandemic potential, drawing from studies of the effectiveness of the restrictions used to combat the COVID-19 pandemic. The new knowledge will be generated through publicly available software that can define the range of policy options available to combat an emerging infection, and identify the optimal choices (e.g. face mask requirements, school closures, density limits and lockdowns). This tool will allow government policy-makers and modellers from diverse backgrounds in Australia and across the Asia-Pacific to build realistic and locally-relevant models of infectious disease spread, including those for COVID-19 variants, influenza, monkeypox and other emerging infectious threats. This will inform the development of science-based response strategies to improve health outcomes at both national and international levels. | | | | | |
| DE230100748<br>Ferns, Dr Nicholas J | **Australia and the World Bank: Financing Development and Decolonisation**<br>This project aims to provide the first detailed history of the relationship between Australia and the World Bank. Engagement with international organisations is a central feature of Australian foreign relations. The project expects to provide new knowledge on the connections between development and decolonisation that dictated post-war global politics. Expected outcomes of this project include an enhanced understanding of the international significance of Australia's post-war development and the complex process of Papua New Guinea's decolonisation. This should provide benefits to Australia and the field through a better understanding of how to navigate an increasingly complex international political and economic environment. | 73,088.50 | 149,653.00 | 145,291.00 | 68,726.50 | 436,759.00 |
| | **National Interest Test Statement**<br>Development and nation-building policies are the backbone of Australia's relations with many smaller countries in our immediate region. But the role of non-state institutions in regional economic development remains understudied. Through examining Australia's historical relationship with the World Bank as well as between the Bank and former Australian colonies, this project seeks to provide new insights on how corporate partnerships have been harnessed for regional development. The World Bank continues to be the most influential international organisation in the field of global development. As such, a better understanding of the development and lending strategies of the World Bank, and how they may influence Australia's relations in the region in the future, is of pressing importance. The project has the potential to provide social and economic benefits by improving understanding of the inter-relationships between Australia, the World Bank, and developing nations in our region. | | | | | |

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| DE230100867 | **Bridging the accuracy gap: High-precision parton showers for colliders** | 60,053.00 | 122,106.00 | 123,706.00 | 61,653.00 | 367,518.00 |
| Scyboz, Dr Ludovic M | This project aims at improving the accuracy of parton showers, which are an essential ingredient used in the simulation of high-energy particle collisions. Parton showers generate the large set of particles produced in a collision, in an approximation of the radiation pattern of Quantum Chromodynamics. The low precision of this approximation translates into large uncertainties in critical measurements performed at particle colliders. This project will study novel ways of enhancing the precision of parton showers, and determine accurate estimates of associated uncertainties across all processes under investigation at the Large Hadron Collider. It will be of exceptional importance for the latter's high-precision, high-luminosity program. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Large-scale physics experiments use colliders to smash particles together at very high speeds to probe the nature of matter. When these high-energy collisions occur, scientists examine the scatter of the produced fragments to determine the presence of new particles, and put our knowledge of subatomic forces to the test. This project aims to develop new methods to much more accurately measure the scatter of particles in these collision events than is currently possible. This research will enable the discovery of fundamental new physics, cement Australia's role as a leader in the scientific community across the world, and drive innovation in a field that has direct applications in quantum computing, novel medical imaging technologies and big-data processing. The analysis techniques and computational advances developed in this project will have immediate impact, as they are easily adaptable for use by Australia's private sector, e.g. in finance, consulting and software engineering. | | | | | |
| DE230101012 | **Redefining how T cell recognition drives T cell activation** | 77,758.00 | 156,495.00 | 157,636.50 | 78,899.50 | 470,789.00 |
| Zareie, Dr Pirooz | This proposal aims to define the key mechanisms that determine how T cells recognise and respond to foreign antigens; a critical feature that defines effective immunity. To achieve this goal, this proposal will leverage multidisciplinary collaborations and innovative methods to understand how structural and biochemical features of T cell receptor recognition influences T cell mediated immunity and development. In turn, this project will facilitate further research and development in the burgeoning field of T cell biology and advance life science research in Australia. Furthermore, as T cell biology is relevant to all vertebrates, this research will greatly benefit the conservation of threatened animal species and agriculture. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | T cells are an important class of immune cells, present in all animals with a backbone, including humans. These cells protect against disease caused by various pathogens including bacteria and viruses. As a part of normal maintenance processes in the body, T cells also form the mechanism by which vaccination works. This project aims to gain a better understanding of what makes an effective T-cell immune response, including how these cells are turned on, how they work and how they develop. This knowledge will offer new tools that can be used by biotechnology companies to design improved strategies for generating maximum immune protection, including better vaccines and related products. The outcomes of this project could also be applied in the veterinary and animal health sector to solve problems such as controlling new and emerging infectious diseases in animals, specifically filling an unmet need for livestock and threatened animal species. | | | | | |
| DE230101042 | **Molecular insights into lipid-mediated T cell immunity** | 71,147.50 | 140,945.00 | 139,595.00 | 69,797.50 | 421,485.00 |
| Thirunavukkarasu, Dr Praveena | This project involves the discovery of novel lipids produced by the microbiome that play a significant role in T cell-mediated immunity. Using a combination of cutting-edge technologies such as mass spectrometry, protein crystallography, immunology and biophysics, this project will elucidate the molecular factors that govern the interaction between the identified lipids and T cells. This innovative research will provide fundamental insights into the recognition mechanism of lipids by T cells at a molecular level, thus broadening our knowledge in the field of biological sciences. The expected research outcomes will increase Australia's international research standing in this burgeoning area of lipid-mediated T cell immunity. | | | | | |

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| | **National Interest Test Statement**<br>Our human bodies are equipped with an immune system that consists of different components to defend and protect us against various microbes, including viruses, which we encounter daily. This multidisciplinary project focuses on the discovery of novel fat-based molecules produced by microbes that live within our bodies, and understand how they activate key immune cells, called T-cells, to fight infections. The outcomes will increase Australia's global research standing alongside the generation of novel intellectual property and commercial patents on the novel fat-based molecules discovered. Moreover, the outcomes could ultimately pave the way for designing effective therapeutics that can control immune responses and provide Australians with improved health. | | | | | |
| DE230101173<br>Xie, Dr Stanley Cheng | **Inhibiting adenylate-forming enzymes via a new reaction-hijacking mechanism**<br>This project aims to identify and validate the adenylate-forming enzymes that are susceptible to reaction-hijacking inhibition in malaria parasites. This class of enzymes can be induced to synthesise their own nucleoside sulfamate inhibitor conjugates via a novel mechanism. This project expects to provide new knowledge about the molecular basis of this novel inhibition mechanism and susceptible target enzymes in the parasites. Adenylate-forming enzymes play critical roles in a diverse range of biochemical pathways, such as protein translation and fatty acid metabolism. The project seeks to deliver a new paradigm for the design of future antiparasitic agents. | 62,053.00 | 124,606.00 | 125,106.00 | 62,553.00 | 374,318.00 |
| | **National Interest Test Statement**<br>Although malaria is not endemic in Australia, cases are brought into the country by travellers infected elsewhere and the northern parts of Australia are at future risk. This project demonstrates a new strategy in the fight against malaria by turning the parasite's own cellular processes against itself. This mechanism, called "reaction-hijacking", is a powerful new tool in chemical biology and will also likely be effective in developing new treatments against closely related pathogens of medical and veterinary importance to Australia, such as parasites that cause leishmaniasis (spread by sandfly bite), toxoplasmosis (spread through undercooked meat) and babesiosis (spread through tick bites). Furthermore, the "reaction-hijacking" mechanism can be applied to inhibit bacterial enzyme targets. Following further research, this work may lead to the downstream development in industry of new antibiotics and anti-infectives, with Australia realising economic benefit from the global antibiotics market. The project outcomes will advance understanding of parasites like malaria, and help to identify new treatment options for infectious diseases. | | | | | |
| DE230101346<br>Bay, Dr Sean K | **Cave microbial metabolism as a missing biogeochemical sink**<br>The aim of this project is to unveil the microbial biodiversity, novel metabolic capabilities and chemosynthetic primary production of subsurface ecosystems, such as those found in caves. Leveraging a powerful blend of geospatial, molecular and biogeochemical approaches this project expects to identify the microbial basis of subsurface biogeochemical processes driving the earth's major elementary cycles. Expected outcomes include a predictive framework to assess and upscale the impact of these microbial communities on the environment. Benefits include predicting and responding to climate risks, such as the desertification of agricultural soils, by uncovering how microorganisms respond to nutrient and carbon depletion. | 66,672.00 | 140,642.00 | 142,774.50 | 68,804.50 | 418,893.00 |
| | **National Interest Test Statement**<br>The increasing frequency of natural hazards such as drought, desertification and pollution are a significant risk to the Australia's natural assets of soil, water and atmosphere, which are critical to its primary industries. This research will provide quantitative estimates and a predictive framework to better understand the role of keystone microbial processes, which are responsible for the cycle of carbon and major nutrients between surface and subsurface ecosystems. This research will provide direct benefits to national monitoring systems, land managers and policy makers via an improved accuracy and precision in predicting the microbial response to environmental change and their control over greenhouse gases such as carbon dioxide and methane, as well as an improved capacity forecasting the effects of natural hazards on soil fertility such as nutrient depletion and pollution of atmospheric and water assets. The engagement with direct beneficiaries will be achieved via open access research and dissemination of results at relevant scientific outlets, meetings and workshops. | | | | | |

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| DE230101556 | **Investigating the responses of Australian native bees to climatic warming** | 77,428.00 | 151,668.50 | 134,175.00 | 59,934.50 | 423,206.00 |
| Howard, Dr Scarlett R | This project aims to investigate changes to native bee cognition, morphology, and pollination capability in response to climatic warming. Using emerging experimental methods for behavioural testing and state-of-the-art 3D modelling of museum specimens, the project expects to identify which species are likely to experience change under future climate scenarios. This project expects to determine if increased temperatures cause pollination deficits through impaired bee cognition and changed morphology. The knowledge gained in this project will allow us to identify vulnerable species and develop strategies across agriculture, government, and community sectors to support pollination and inform conservation priorities. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Bees provide a critical role in pollination across native ecosystems and agricultural crops. However, we currently do not know how climate change will affect pollination patterns of Australian bees across both natural and agricultural environments. This project will determine how native bee behaviour, body size and shape respond to increased temperatures and climate change, and the potential effects on pollination patterns. The results will enable us to predict which species of native bees, and the plants they pollinate, are most at risk under future climate scenarios so we can act to conserve them. The project could also provide tools to help optimise pollination in managed honeybees as well as support a growing industry of native bee pollination and products. The project will also allow agricultural peak bodies to accurately forecast future pollination needs for Australia as the climate changes. | | | | | |
| DE230101681 | **Cryo-electron microscopy determination of G protein-coupled receptor states** | 76,464.50 | 152,442.00 | 152,105.00 | 76,127.50 | 457,139.00 |
| Zhang, Dr Xin | This project aims to address fundamental knowledge gaps in understanding of the molecular mechanisms of peptide hormone G protein-coupled receptor activation. This will be achieved through cryo-electron microscopy determination of the structure and dynamics of key intermediate states in activation. Novel biochemical approaches will be applied to capture these states, using as exemplar the glucagon receptor that has a broad range of pharmacological tools to facilitate isolation of distinct functional states. The knowledge gained from these studies will advance fundamental understanding of physiologically important receptor activation and efficacy, while the approaches developed will enable similar investigation of other receptor classes. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | A vital function of cells is that they communicate with each other and respond to external factors. One of the key biological molecules that control this is embedded in the outer layer of cells: G-coupled protein receptors. What remains mysterious about these biological messengers is how a single receptor can communicate different types of internal signals. This project aims to address this important question by determining the shape of these molecules, utilizing a cutting-edge electron microscopes. With cellular miscommunication being one of the key causes of human disease, this detailed molecular understanding has the potential to transform how future pharmaceutical drugs are developed. The scientific techniques pioneered in both protein biochemistry and electron microscopy will be broadly applicable to the future Australian pharmaceutical drug development research as G-coupled protein receptors represent 40% of all clinical drug targets. | | | | | |
| | **Monash University** | 1,488,975.00 | 3,006,210.00 | 2,987,456.50 | 1,470,221.50 | 8,952,863.00 |
| **RMIT University** | | | | | | |
| DE230100138 | **Developing Switchable Ligands to Control Gold Nanocluster Interfaces** | 73,184.00 | 141,543.00 | 136,718.00 | 68,359.00 | 419,804.00 |
| Noble, Dr Benjamin B | This project aims to unlock the promising catalytic activity of protected gold nanoclusters by developing switchable ligands capable of undergoing controlled detachment and exchange. This project expects to provide a detailed understanding of how the gold thiolate interface of nanoclusters influences their physical and chemical properties. Expected outcomes include the design of improved catalysts for chemical synthesis and biological assays using computer aided chemical modelling. These catalysts should be easier to recover after use, which should improve cost-effectiveness. They should also improve the accuracy of biological sensors, which could ultimately be used for the rapid and early detection of diseases. | | | | | |

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| | **National Interest Test Statement**<br>Gold nanomaterials are ultra-small gold particles that are used in chemical production, and as sensors and medicines. These materials are essential to Australia's chemical, biotechnology and health-care sectors, but they are also expensive, difficult to recover, and can degrade unpredictably. By identifying and suppressing the ways these nanoparticles break down, this project will provide tools that rapidly predict the stability of gold nanomaterials and design strategies that improve their durability. Australia's biotechnology sector could use these tools to reduce material screening costs and improve safety. Australian chemical manufacturers could use these design strategies to create more versatile, cost-effective and sustainable gold nanomaterials. Access to more stable and affordable gold nanomaterials would translate to better practical outcomes for their developing applications, including renewable fuel production, rapid disease detection and medical imaging. By enabling these innovations, this project could deliver significant economic, commercial and health benefits to Australian communities. | | | | | |
| DE230100192<br>Broadway, Dr David A | **Quantum sensing of magnetism in two dimensions**<br>This project aims to use innovative quantum sensing technologies to investigate the novel emerging field of two-dimensional magnetism; imaging both static and dynamic forms of 2D magnetism. This project expects to generate new knowledge about magnetic van der Waals materials and their potential application to ultra-thin electronic and spintronic devices. Expected outcomes of this project are a deeper understanding of the formation and modulation of magnetic order in 2D, new fabrication methods for deliberate domain wall formation, production of near-zero energy gap spin-waves, and new encapsulation methods for ultra-stable 2D materials. This should provide significant benefits towards fundamental physics and future device engineering. | 78,659.00 | 156,159.00 | 150,500.00 | 73,000.00 | 458,318.00 |
| | **National Interest Test Statement**<br>Two-dimensional (2D) magnetic materials promise to reduce energy consumption in electronics and improve data storage, but there a lack of understanding of how magnetism forms in these materials, which limits our ability to find materials that have the qualities necessary to manufacture cheap, energy efficient alternatives to current electronics. This project will use a magnetic microscope to investigate magnetism in these materials. The outcomes of this research will improve our understanding of these materials and how they can be used to manufacture new and improved electronics. The production of electronic components with 2D materials is still in its infancy. The knowledge that this project will obtain can be used to improve future designs, which will help to position Australia at the forefront of this rapidly expanding industry. There are potentially great commercial benefits to this study to both the Australian electronics and advanced manufacturing industries. This proposal relies on a novel microscope that only exists in a few laboratories in the world. | | | | | |
| DE230100327<br>Wang, Dr Helena Yuan | **Porous Tandem Catalyst for CO2 Conversion into Sustainable Chemicals**<br>This project aims to develop new strategies to design and tune the performance of multifunctional catalysts for the conversion of carbon dioxide as a sustainable feedstock for the production of valuable commodity chemicals used in the manufacture of consumer products. New insights into reaction mechanisms, and relationships between catalyst structure and performance, are expected through innovative analytical tools. Anticipated outcomes include a toolkit of catalyst design principles, underpinning the development of next-generation catalysts with superior energy efficiency, waste minimisation, and associated socioeconomic benefits, which should contribute significantly to Australian science, industry and the environment. | 71,278.00 | 137,560.00 | 130,835.00 | 64,553.00 | 404,226.00 |
| | **National Interest Test Statement**<br>Australia has a long-term emissions reduction plan to achieve net-zero emissions by 2050. However, this requires emerging technologies to deliver the remaining abatement necessary to reach net zero without harming the economy and jobs. This project will develop novel methods to prepare inexpensive catalysts (that speed up chemical reactions) to convert carbon dioxide waste into high-value-added chemicals such as fuels and plastics. These catalysts can be readily adopted by the chemical industry into their current manufacturing processes. The outcomes of this project will provide economically efficient routes to producing sustainable chemicals by recycling carbon dioxide in industrial processes, strengthening Australia's world-leading chemical manufacturing industry, and offering new investment opportunities, associated jobs, and wealth creation. Using atmospheric carbon dioxide in chemical manufacturing will help Australia work towards its net-zero emissions targets, reduce climate change, and positively impact human health and quality of life. | | | | | |

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| DE230100383 | **Photothermal management with graphene metamaterials** | 76,859.00 | 151,318.00 | 148,418.00 | 73,959.00 | 450,554.00 |
| Lin, Dr Keng-Te | Environmental and industrial thermal management represents major global energy consumption and CO2 emission. This project aims to investigate a game-changing passive thermal management solution to tackle both heating and cooling problems without using any electricity. This is made possible by designing a nanostructured graphene metamaterial to either totally reject or totally absorb electromagnetic waves in certain spectral ranges. Expected outcomes include new design and fabrication strategies for novel photothermal films with high performance and cost-effectiveness. This is expected to lead to the development of novel energy efficient technologies for Australian industries, producing direct economic, social and environmental benefits. | | | | | |
| | **National Interest Test Statement**<br>Maintaining a desired temperature is needed in homes, offices, electronics and industrial production, and consumes large amounts of electricity. This project addresses this issue by developing novel materials that will both use sunlight for heating and disperse heat for cooling without the need for electricity. The innovative materials can be attached to buildings or integrated with electronic devices to improve the efficiency of temperature control. They could be used to capture heat generated by industrial processes and use that heat to generate electricity that will reduce energy costs. The materials developed in this project can be readily produced by the construction industry for use in both new buildings and added to the exteriors of existing buildings. There is also great potential for using these materials in electronics such as smart phones, and in data centres that produce very large amounts of heat. The adoption of these materials by Australian homes and businesses will significantly reduce heating and cooling costs. Their use in electronic devices will increase both performance and lifetime. | | | | | |
| DE230100964 | **Precision Rulers for the Visible - Chip Scale Optical Frequency Combs** | 76,059.00 | 152,118.00 | 152,118.00 | 76,059.00 | 456,354.00 |
| Boes, Dr Andreas | This project aims to create a photonic chip technology that generates hundreds of coherent laser lines in the visible spectrum from a single chip for accurate sensing, imaging unknown objects and measuring gas emissions. The project expects to introduce this new capability in the current photonic chip technology, which currently only operates with infrared light. The expected outcomes are inexpensive, stable and energy-efficient devices the size of a fingernail that will enable measurements with unprecedented accuracies. This should allow these devices to be mounted on drones, satellites, and robots, making them attractive for defence, information security, imaging, autonomous vehicle, and sensing applications. | | | | | |
| | **National Interest Test Statement**<br>Electronic microchips have transformed our lives, with applications in mobile phones, computers and many other technologies. We are now on the cusp of the next technological revolution, that uses light instead of electricity in microchips to process data much faster and more energy efficiently, enabling, for example, instantaneous imaging and identification of hazards for autonomously driving cars, improved monitoring of air quality in cities and precision navigation of drones. However, currently there is a lack of high-quality light sources on such microchips. This project will explore new materials and advanced manufacturing processes to create high-quality, inexpensive and energy efficient microchips that use light. Such microchips have high potential for commercialisation and the intellectual property will be protected, creating opportunities for licensing and start-up ventures. Another outcome of the project will be a new service to rapidly produce prototype chips for Australian companies to develop. The expected benefits will be a greater and quicker adoption of this technology in Australian products. | | | | | |
| DE230101221 | **Eco-friendly low shrinkage concrete integrating upcycled textile waste** | 71,859.00 | 143,718.00 | 143,718.00 | 71,859.00 | 431,154.00 |
| Gunasekara, Dr Chamila M | This project aims to investigate a novel solution incorporating upcycled textile waste to reduce shrinkage induced cracking in reinforced concrete. The project is expected to generate new knowledge in crack nucleation and healing mechanisms in concrete and the application of flexible textile fibre reinforcement to control shrinkage induced cracking, creating a new fibre reinforced composite. The expected outcome is a reduction in construction waste through extending the life span of concrete structures and reducing textile waste, 85% of which is currently disposed in landfills. The new composite could deliver a circular solution to textile waste leading to significant social, environmental and economic benefits. | | | | | |

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| | **National Interest Test Statement**<br>Movement of reinforced concrete slabs used in foundations of buildings and airport runways leads to cracking and reduction in life expectancy, often leading to demolition and reconstruction creating large volumes of waste. Almost all textile waste from fabric and carpets in Australia is disposed in landfills. The project will develop a novel solution to reduce cracking in reinforced concrete ground slabs by incorporating waste textile fibre as reinforcement. The outcomes will create a value-added solution for textile waste. Adoption of the solution by the Australian construction industry will be enabled through collaborations with relevant industry partners and local government. The outcomes will extend the life expectancy of concrete ground slabs, reduce the waste and emissions from demolition and reconstruction, and recycle, therefore reducing the amount of textile waste in landfills. Understanding how to prevent cracks in textile concrete will improve reinforced concrete design guidelines and standards adopted by construction companies, infrastructure authorities and concrete industry peak bodies. | | | | | |
| DE230101306<br>PRAMANIK, Dr BIPLOB | **Metal organic framework-based membrane for nanoplastics removal**<br>The aim of this project is to understand the fundamental science governing the removal of nanoplastics from wastewater by developing an innovative dually charged metal organic framework based nanocomposite ultrafiltration membrane. The project expects to lead to a breakthrough in our scientific understanding of how nanoplastics and other pollutants can be efficiently removed from wastewater using membranes. The expected outcome is a process that can be used to convert wastewater into freshwater suitable for household, industrial and agricultural use. Such removal could also be of significant environmental benefit, as secondary effluent is a significant source of nanoplastics entering the aquatic environment. | 75,359.00 | 147,218.00 | 143,718.00 | 71,859.00 | 438,154.00 |
| | **National Interest Test Statement**<br>Nano- and microplastic contamination in water is a major environmental threat, significantly impacting health, for example by impairing reproduction in aquatic animals. Current treatment technologies are limited in their ability to remove these pollutants from wastewater, leading to their release into open water environments. The aim of this project is to develop novel ultrafiltration membranes for the removal of these pollutants. The membranes will enable conversion of contaminated wastewater into water suitable for household, industrial and agricultural use. The project will develop membranes that will be integrated into existing wastewater treatment facilities after pilot scale studies in collaboration with membrane manufacturers and water industries. The outcome of the project will significantly assist Australia's water industries to recycle treated wastewater and provide alternative high-quality water to meet the growing water demand. It will contribute to the health of waterways by replenishing with highly treated recycled water resulting from the proposed treatment process. | | | | | |
| DE230101344<br>Song, Dr Tingting | **Hierarchical Ta-Ti lattice materials by 3D printing and nanofabrication**<br>This project aims to develop a novel approach to the manufacture of hierarchical Ta-Ti lattice materials with a fine nanoporous Ta surface through capitalizing on the advantages of metal 3D printing and a unique post nanofabrication process. This project expects to generate new fundamental knowledge in the design and manufacture of hierarchical metal lattice materials. Expected outcomes include a new advanced manufacturing method and a new class of highly biocompatible hierarchical Ta-Ti lattice materials. The former should benefit the Australian Manufacturing Industry for the manufacture of a variety of novel metal lattice materials or products while the latter has the potential for applications as implant materials. | 73,609.00 | 146,968.00 | 145,318.00 | 71,959.00 | 437,854.00 |
| | **National Interest Test Statement**<br>Approximately one in every 200 Australians has joint replacement surgery each year and this percentage is expected to increase as our population ages. Current replacements only last up to 10-15 years due to poor integration with bone, leading to more complicated and expensive revision surgeries. As a result, the industry is in urgent need of new implant materials that integrate firmly and permanently with bone. The goal of this project is to develop a new 3D printing-based method to fabricate a novel class of implant material with an internal bone-like structure. Implants made of this new material have the potential to achieve fast, robust and durable integration with bone, thereby greatly reducing the need for revision surgeries in the future. Patents or new intellectual property resulting from this project will be made immediately available to Australian small and medium-sized enterprises. The unique advantages of this new implant material are expected to facilitate rapid adoption by industry, increasing the competitiveness and market share of Australian implant manufacturing companies. | | | | | |

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| DE230101504 | **Crossing restrictive biobarriers with self-assembled lipid nanocarriers** | 78,351.00 | 148,682.00 | 140,662.00 | 70,331.00 | 438,026.00 |
| Dyett, Dr Brendan P | This project aims to determine how nanoscale objects which mimic the surface of cells behave in biologically relevant environments. This project expects to generate new knowledge in physical chemistry by complementing innovative surface chemistry design and characterisation with data science approaches. The expected outcome of this project is identification of the mode of interaction of these biomimetic objects with cells, which may then reveal a new pathway for the delivery of pharmaceuticals. This could provide significant future benefits in the treatment of neurological diseases and bacterial infections, by overcoming the barrier that the cell surface presents to the uptake of many medicinal drugs. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Given that innovative medicine is a primary driver within the pharmaceutical industry (8.7 billion contributed per year to Australian economy and supporting over 20,000 full time jobs), this project's outcomes have significant economic benefits. The blood-brain barrier is the most restrictive barrier in the body. The restriction of pharmaceutical compounds across this barrier complicates the treatment of neurological disorders. Likewise, the bacterial membrane restricts the entry of antibiotics contributing to resistance. This dissuades drug development in these areas due to relatively high risk of failure in later stage trials. At the same time, Australia is faced with an aging population and rising prevalence of antibiotic resistance. This project will develop a new method to allow pharmaceuticals to traverse these barriers, improving the effectiveness of existing treatments and unlocking new treatment avenues for existing (and new) pharmaceuticals. Improved effectiveness of treatments will improve patient outcomes, reducing costs to the Australian health sector and improving national productivity. | | | | | |
| DE230101542 | **Impact of humoral immunity on nanoparticle–biological interactions** | 74,859.00 | 150,218.00 | 150,218.00 | 74,859.00 | 450,154.00 |
| Ju, Dr Yi | This project aims to improve the biological applications of nanomaterials by understanding their fundamental interactions with proteins and cells in relevant biological environments. This will create new knowledge on how humoral (antibody-mediated) immunity affects nanomaterials using cutting-edge immunoassays, bio–nano characterisation techniques, and bioinformatics. Expected outcomes of the project include an understanding of how specific antibodies modulate the protein coatings on nanomaterials, which will shed light on how immune cells interact with nanomaterials. This will lead to design principles for nanomaterial properties to improve their effectiveness in delivering drugs and gene therapies. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Nanoparticles are tiny particles with dimensions 1000 times smaller than the diameter of a human hair that have many commercial uses. mRNA vaccines are a new and rapidly developing immunisation system, but mRNA is fragile and needs to be encased in nanoparticles to prevent them being destroyed in the body. However, we have little understanding of how these nanoparticles interact with the body's immune system, which is important to developing more effective mRNA vaccines. This project will develop nanoparticles with different properties and explore their interactions with the immune system to better understand their immune responses. The knowledge gained can be used by Australian companies to develop new mRNA vaccine delivery nanoparticles with improved efficacy and reduced side effects. This will contribute to Australia's efforts to develop mRNA technology for the benefit of the nation's health and economy. Furthermore, the nanoparticles developed can be commercialised for veterinary and biomedical applications, thus providing opportunities for Australian start-up companies. | | | | | |
| | **RMIT University** | 750,076.00 | 1,475,502.00 | 1,442,223.00 | 716,797.00 | 4,384,598.00 |

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| **Swinburne University of Technology** | | | | | | |
| DE230100055 | **Illuminating the dark Universe with explosive astrophysical events** | 74,239.50 | 148,479.00 | 148,479.00 | 74,239.50 | 445,437.00 |
| Möller, Dr Anais | Explosive astrophysical events are critical to understand what the Universe is made of and its physics. This project aims to single out the most exciting exploding stars and extreme events out of the millions detected each night at the world's largest optical telescope. It will magnify Australian leadership and optimise investment in astronomical facilities by obtaining unique information before these events fade forever. Expected outcomes include improved knowledge on the nature of exploding stars and the discovery of new events and physical processes. It will benefit the Australian community at large by training young Australians in data-intensive technologies required to lead ground-breaking research and advance our innovative economy. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project will develop new techniques to comb through the massive data from the world's biggest telescope. It will single out and communicate sudden astrophysical events so scientists around the world can study them in real time. Events like exploding stars and radiation bursts, create chemical elements, stars and galaxies. They are crucial to understanding the fundamental chemical and physical processes of the Universe that form the basis of all 'life'. Unfortunately, the conditions that create them remain unknown and, because they happen so quickly, current algorithms cannot accurately identify them in time to gather the data needed to closely examine them. Due to its geographic position and infrastructure, Australia is the only place in the world where many of these events can be observed before fading. With this data, we will answer long-standing questions about the creation of elements and the nature of matter and gravity. Understanding these events is critical to humankind's survival and that of our planet. The project will develop artificial intelligence techniques to sift through massive datasets which will ultimately benefit any industry that uses or relies on large datasets such as marketing, medical diagnostics and economics. | | | | | |
| DE230101068 | **Direct Electrolysis of Amine Captured CO2 for Producing Syngas** | 76,259.00 | 153,018.00 | 151,018.00 | 74,259.00 | 454,554.00 |
| Li, Dr Peng | This project aims to develop electrolysis of amine captured carbon dioxide (CO2) technology to integrate CO2 capture and syngas production powered by renewable electricity. The aqueous amine captured CO2 will be directly electrolysed without CO2 desorption, compression, and purification, featuring extremely high efficiency and cost-effectiveness. Expected outcomes include the delivery of suitable amines, a family of chemically and structurally controlled electrocatalysts, an in-depth understanding of CO2 electrolysis mechanisms, and the demonstration of robust electrolyser prototypes. This project will provide significant benefits to Australia's energy and environmental security, and boost its clean energy industry and economic growth. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | One promising approach to reducing carbon emissions is to use renewable electricity to drive chemical reactions to convert carbon dioxide (CO2) into useful fuels. However, current CO2 conversion methods are separate add-ons to the process rather than being built into the process itself, which makes them energy-intensive, inefficient, and expensive. This project will use purposely designed catalysts to integrate CO2 capture and conversion and directly transform waste CO2 streams into synthetic gas ('syngas') which is already widely used to manufacture synthetic fuels. Syngas fuels can be used directly in the iron, steel, fertiliser and cement industries, and could also be used to power households and cars. By capturing and recycling CO2 in one step using renewable energy, this project will significantly contribute to ongoing efforts to build a clean energy solution which reduces our environmental footprint and contributes to economic growth for Australian industries. | | | | | |
| | **Swinburne University of Technology** | 150,498.50 | 301,497.00 | 299,497.00 | 148,498.50 | 899,991.00 |

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| **The University of Melbourne** | | | | | | |
| DE230100067 | **Predicting the future threat of mosquitoes under climate change** | 78,884.50 | 155,903.00 | 151,232.00 | 74,213.50 | 460,233.00 |
| Stott-Ross, Dr Perran A | This project aims to predict the future distributions of local and invasive mosquito species under climate change by testing their ability to adapt to hot, cold and dry environments. The project expects to generate new knowledge by identifying traits that underpin climate change adaptation in mosquitoes. Expected outcomes of this project include an enhanced understanding of future mosquito distributions through new predictive models that incorporate adaptive changes. This should provide significant social and economic benefits, with outcomes intended to improve the management of local pest mosquitoes and prepare Australia to tackle invasive mosquito threats. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Mosquitoes in Australia pose threats to human and animal health by transmitting disease-causing agents, including dengue and Ross River virus. This research aims to enhance our understanding of future mosquito distributions in response to climate change, leading to significant benefits for Australia. It will develop new models that better predict future mosquito distributions, preparing Australia to tackle invasive mosquitoes that reach the mainland in future decades and protecting the health of Australians. Knowledge gained from this project can be used by governments to inform pest control interventions and improve land management, providing environmental benefits by mitigating the spread of local pest mosquitoes under climate change. In the long term, an improved understanding of future mosquito distributions will be useful for forecasting populations at risk of mosquito-borne diseases, leading to social and economic benefits by protecting Australia's citizens and workforce. | | | | | |
| DE230100084 | **Deciphering the rules of T cell residency across intestinal compartments** | 78,259.00 | 157,068.00 | 157,618.00 | 78,809.00 | 471,754.00 |
| Evrard, Dr Maximilien | Tissue-resident memory T cells (TRM) are key for immune protection against infection and cancer at barrier sites including the gut. Whilst much of our understanding of gut TRM comes from studies on the small intestine, how these cells develop and function in the large intestine is unknown. Using state-of-the-art techniques and novel animal models, this project aims to (i) identify molecular pathways by which the local intestinal microenvironment influences TRM development and (ii) how these pathways could modulate TRM generation specifically in the small or large intestine. The expected outcomes are to generate fundamental new knowledge that will have significance for regulation of the immune response. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Immune T cells that protect us from pathogenic microbes are mostly located in the lymph nodes and spleen. However, following resolution of intestinal infection immune T cells are "directed" to remain in the intestines where they can provide rapid immunity towards future gut infections. This project seeks to understand the molecular factors that cause immune T cells to remain resident in tissues like the gut. This knowledge will allow vaccine design to specifically direct the tissue location of immune T cells to optimise defence against future infections anywhere in the body. Vaccines that ensure immune T cells are in the right place to guard against future infections would bring great benefit to veterinary and human health. Discoveries developed as part of this proposed project are expected to result in commercial products and patent applications for improved vaccination strategies, strengthening Australia's leadership in this field. | | | | | |
| DE230100098 | **Law, Literature and Naturalization in an Age of Empire** | 62,415.50 | 124,403.50 | 122,514.00 | 60,526.00 | 369,859.00 |
| Mierowsky, Dr Marc B | The history of naturalization offers significant insights into how sociocultural and legal limits on citizenship evolved, and how these limits were imposed and experienced before the advent of border restrictions. Deploying innovative methods at the intersection of literary, legal and cultural history, this project aims to provide the first global account of Jewish naturalization during the British empire's expansion, a crucial phase in immigration history. This account will generate new knowledge about how minority communities are incorporated into the state. Its benefits include a new framework to document the lives of migrants and refugees and the development of novel cultural resources to address the social challenges of migration. | | | | | |

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| | **National Interest Test Statement**<br>How and whether nations choose to grant citizenship to immigrants is a question of enduring and current importance. An agreed process of 'naturalization' is fundamental to national social cohesion. This project investigates how the idea and process of naturalization evolved in Australia in relation to the expansion of the British empire. It charts this history through literary sources, immigration records, and explores how ideas from the 18th-century European Enlightenment continue to influence Australian understandings of citizenship and rights. This will help us better understand contemporary Australian civic identity and where our ideas about social integration have come from. The project will create a historical and cultural record, accessible to local communities through workshops, exhibitions, and a digital archive of stories about how diverse people and early immigrants and refugees have experienced the transition to citizenship. This will interest many Australians and deepen knowledge and understanding of our past. | | | | | |
| DE230100257<br>Schmidt, Dr Thomas L | **Molecular biosecurity: Genomic databanks for managing new pest invasions**<br>This project aims to develop a set of genomics-based approaches for analysing new pest invasions. By producing and analysing genomic databanks for four insect pest species, including three that have recently invaded Australia, this project expects to identify invasion origins and to track new pest incursions within Australia. The project should also provide insights into pest ecology, including movement rates and population change over time. This information can enable more efficient deployment of biosecurity resources and pave the way for genomics to be used pre-emptively to stop new invasions. This can help make genomics a go-to response to new pest invasions and position Australia at the forefront of genomics-based pest biosecurity. | 72,991.50 | 147,104.00 | 150,437.00 | 76,324.50 | 446,857.00 |
| | **National Interest Test Statement**<br>This project will develop new digital and molecular tools for Australian biosecurity. Specifically, it will use genomics to determine where insect pest invasions have invaded from, to trace the origins of new pest incursions into and through Australia, to estimate how quickly pests can spread, and to help assess the likelihood of success of future pest control strategies. These outcomes will confer considerable benefits to Australian growers by helping to restrict the spread of insect pests and limit economic losses from them. Knowledge of incursion pathways within Australia will help improve efficiency of border biosecurity operations which aim to stop pests from spreading into new regions. Genomic tracing of pests can strengthen national and state biosecurity programs, and can validate biosecurity risk models currently used in decision making. Investment in this project will help reposition Australian biosecurity towards and digital and molecular future, where it is well-positioned to emerge as a global leader. | | | | | |
| DE230100366<br>Borovica-Gajic, Dr Renata | **From data to fast insights: a database system for seamless data exploration**<br>This project aims to develop a next-generation database platform for seamless data exploration, where users can interactively search for insights buried in the data, without a clear outcome in mind. Unlike today's database management systems, this platform does not require costly experts to tune the database for fast responses, and guides users towards finding insights. Using the latest advancements in machine learning to facilitate data exploration and reduce the time and effort to discover insights, this open-source database platform should provide significant benefits to Australian businesses and boost scientific discovery, increasing Australia's competitiveness in the global data-driven market. | 69,000.00 | 139,000.00 | 145,000.00 | 75,000.00 | 428,000.00 |
| | **National Interest Test Statement**<br>A rich variety of data is increasingly being created, such as from the sensors embedded in infrastructure and devices, large scientific experiments, finance, air quality and temperature monitors, and road sensors. Data exploration is the process of analysing data to reveal hidden patterns and anomalies. These insights can, for example, improve farming processes, reduce production costs, and improve the efficiency of institutions such as hospitals. However, data exploration is often a slow, labour-intensive process requiring costly specialised expertise. Using new machine learning techniques, this project will advance data exploration making it accessible to non-experts by automating laborious and complex tasks currently performed by experts. The new data exploration techniques will reduce the time, cost, and effort in finding new insights and will be made openly available. Their use by data-heavy Australian industries and public utilities will lead to improved decision-making, increased efficiency, and better use of resources, boosting Australia's economy. | | | | | |

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| DE230100435 | **Measuring and predicting sea spray spume droplets in the field** | 70,303.00 | 141,981.00 | 143,981.00 | 72,303.00 | 428,568.00 |
| Voermans, Dr Joey J | Sea spray spume droplets modulate heat and moisture fluxes between the ocean and atmosphere. These fluxes are a major source of uncertainty in extreme weather forecasting models due to a lack of reliable field measurement techniques. This project aims to develop a novel measurement technique to measure sea spray and generate new knowledge on the magnitude and nature of sea spray spume production. Expected outcomes include novel tools, a baseline dataset of sea spray field observations and predictive capabilities. Providing critical information to forecast extreme weather and tropical cyclones, this research will improve accuracy of coastal weather hazard prediction providing many social and economic benefits for Australia and other nations. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Tropical cyclones are among the most destructive and deadly natural disasters in Australia, accounting for one-quarter of the annual A$38 billion in damages caused by natural disasters. Reliable forecasts are critical to mitigate their impact on coastal communities and offshore industries. While predicting the tracks of cyclones has improved in recent decades, predictions of their intensity has not. This lack of improvement is in part attributed to the lack of understanding of sea spray (small droplets blown from the ocean surface into the air) generated during extreme winds as there are currently no reliable techniques available to measure sea spray near the ocean surface. By developing innovative measurement techniques and predictive models of sea spray generation, this research will provide the knowledge and tools to significantly improve forecasting of tropical cyclone intensity. Better forecasts of tropical cyclone will allow Australia to mitigate their impact through improved disaster management, decision making and risk reduction, and bolster trust and safety of coastal communities and industries. | | | | | |
| DE230100473 | **Effective integration of human and automated analyses for security testing** | 68,359.00 | 136,718.00 | 136,718.00 | 68,359.00 | 410,154.00 |
| Pham, Dr Van Thuan | This DECRA project aims to significantly improve the performance of current state-of-the-art automated security testing approaches, enabling them to discover more security bugs in strict time constraints. The key innovation of the project is its novel way to embrace human element to leverage the ingenuity of the developers. This project will help companies improve the security and reliability of their products, thwarting cyberattacks that cost Australian business $29 billion each year. The knowledge from this project will be transferred and integrated into higher education subjects to train the next generations of software developers, who are responsible to build security-critical systems that we all rely on now and in the future. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | As a digital nation, cybercrime heavily impacts Australian government, businesses and infrastructure. One of the most common ways for hackers to perform cyberattacks is by exploiting undetected security vulnerabilities in software systems. This project will blend knowledge of human cybersecurity experts together with automated tools to design new ways to detect software flaws in a shorter time. The resulting cost-effective software testing approach will help Australian software companies discover vulnerabilities in their software systems before deployment, making their systems more secure and reliable. More secure and reliable software systems will have economic and social benefits for Australia by reducing cyberattacks that cost Australian business over $20 billion each year in lost productivity. This project will also bring educational benefits as outcomes will be used to train the next generation of software developers in essential security-critical methods. | | | | | |
| DE230100622 | **Ending Aqua Nullius: Sustainable and Legitimate Water Law in Settler States** | 73,868.00 | 148,123.00 | 152,307.00 | 78,052.00 | 452,350.00 |
| O'Donnell, Dr Erin L | This project aims to investigate how treaty and agreement making can lead to water law reform in settler colonial states. This project will use interdisciplinary approaches in Australia, Aotearoa New Zealand, Canada and the US to develop new knowledge of how Indigenous sovereignty shapes water law. Expected outcomes of this project include enhanced collaborations between researchers and Indigenous Peoples, evidence-based law and policy guidelines for ethical, pluralist water laws, and context-specific pathways for water law reform developed in partnership with Indigenous Peoples as part of Treaty-making. This should provide significant benefits, such as improving both the legitimacy and ecological sustainability of water law in Australia. | | | | | |

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| | **National Interest Test Statement**<br>This project will improve both the sustainability and legitimacy of water law in Australia. Rural and regional communities depend on irrigated agriculture (worth over $AUD17.7 billion in 2018). Australia has not yet addressed the injustice of the historical and ongoing denial of Indigenous water rights, now identified by the Productivity Commission as a key priority. This project will use global insights and local partnerships with Indigenous Peoples to deliver evidence-based policy and law reform recommendations to government agencies to achieve a more holistic, inclusive, legitimate, and just water law framework in Australia. New legal models for water management through treaty and agreement making will increase Indigenous access to water, which delivers a wide range of cultural, social, health, and economic benefits for Indigenous Peoples. The project will also produce transformative new legal mechanisms, reflecting a 'Caring for Country' ethos, that will help to deliver more ecologically sustainable water management for all Australians, and support resilient, economically robust, regional communities. | | | | | |
| DE230100691<br>Arndt, Dr Sonja K | **Constructing a framework for early childhood teachers' cultural wellbeing**<br>This project aims to raise early childhood teachers' cultural wellbeing and belonging, by strengthening anti-racist orientations and inclusion in their teaching teams. This project expects to generate new knowledge in this under-researched area, by using innovative, interdisciplinary approaches involving early childhood teachers in Brisbane, Sydney, Melbourne, and Auckland in sharing their culture stories in multimodal ways. Expected outcomes of the project include a guiding framework to enhance intercultural practices in early childhood settings, enhanced international collaborations, and significant benefits to the educational outcomes, cultural understandings and social wellbeing of Australia's very young children. | 65,000.00 | 130,000.00 | 130,000.00 | 65,000.00 | 390,000.00 |
| | **National Interest Test Statement**<br>The wellbeing of early childhood teachers is one of the most under-researched and crucial elements in the education of Australia's youngest children. It is recognised as critical to stem high rates of teacher attrition and burnout, especially in the face of the Covid-19 pandemic and other national and international crises. This project examines early childhood teacher cultural wellbeing, belonging and identity. It addresses National Research Priorities by improving health, economic and cultural outcomes for early childhood teachers, building new scientific knowledge by elevating and drawing on early childhood teachers' culture stories, to develop anti-racist, inclusionary intercultural relationships and strategies. The project strengthens young children's educational success by recognising the pressures on early childhood teachers at the forefront of Australia's educational pathways. Addressing teachers' sense of wellbeing, cultural belonging and worth, the project raises the capacity of early childhood teachers to preserve communities, infrastructure and the Australian economy in its post-Covid recovery. | | | | | |
| DE230100721<br>Lisé-Pronovost, Dr Agathe | **A new dating tool for Australia's cultural and natural history**<br>This project aims to advance Australian geochronology and Earth magnetic field research by constructing high-quality paleomagnetic records from stalagmites and lake sediments. It is expected that this project will provide a new dating capacity in Australia for academia, cultural heritage and government in a region with rich Indigenous history. This should provide significant benefits advancing our understanding of Australia's timeline and raising appreciation of the oldest continuous living culture in the world. The ancient geomagnetic field data will also be integrated into geomagnetic field models as part of the international effort understanding Earth's magnetic field evolution and future impact on society. | 75,306.00 | 150,612.00 | 150,612.00 | 75,306.00 | 451,836.00 |
| | **National Interest Test Statement**<br>Traditional archaeological dating relies on finding remains of radiocarbon (carbon-dating). These can be difficult to find and additional methods of dating are required. Developing accurate data on changes in the Earth's magnetic field through time provides the basis for the magnetic dating method. This project will analyse Australian cave stalagmites and sediments to construct high quality records of magnetic field history. A key outcome will be a new capacity for dating Aboriginal Australian materials by comparing their magnetism to records of the Earth's magnetic field. The project will provide improved understanding of Australia's unique cultural timeline and appreciation of the oldest continuous living culture in the world. The magnetic field has an important role in sustaining life, protecting the Earth from cosmic radiation, and in navigation. Understanding past changes will help with predictions of future changes in Earth's magnetic field, enabling better preparation for impacts on our environment and technological infrastructure. | | | | | |

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| DE230100754 | **Drag Prediction over Rough Surfaces using Hardware-Accelerated Simulations** | 68,359.00 | 142,468.00 | 144,718.00 | 70,609.00 | 426,154.00 |
| Chan, Dr Leon | This project aims to uncover the relationship between roughness topography and drag by utilising high-performance and efficient hardware acceleration. This project expects to generate new knowledge in the area of rough-wall turbulent boundary layer by using state-of-the-art hardware accelerated high fidelity simulations and machine learning techniques to identify important roughness parameters. Expected outcomes of this project include the development of a novel, more accurate, and robust model to predict drag. This would lead to improved data-driven policies for more sustainable and profitable airline and maritime industries. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Australia's global trade relies heavily on sea and air transport and half or more of fuel used in ships and planes is to overcome friction drag arising from surface roughness of the vessels (from corrosion on aircrafts or barnacles and biofouling on ships). The cost of this is called drag penalty, and operators need accurate information on this to ensure surface cleaning schedules are cost-effective. Current predictions of drag penalty are unreliable as changes in surface roughness are variable and unpredictable. Using high quality simulations of whole ships and planes and machine learning, this study will create an accurate tool to predict drag penalty allowing operators to minimise fuel costs and CO2 emissions, providing significant economic and environmental benefits for Australia. These data-driven decisions will improve efficiency of transport operations through optimized scheduling, and project outcomes could contribute to the development of drag reducing surfaces, with potential commercialisation opportunities. | | | | | |
| DE230100761 | **Identifying biases in news using models of narrative framing** | 70,034.00 | 140,893.00 | 145,218.00 | 74,359.00 | 430,504.00 |
| Frermann, Dr Lea | This project aims to develop tools to detect biased narratives and one-sided framing in news stories using novel natural language processing methods to understand the text more deeply. Unlike existing methods, which overly rely on surface word co-occurrences patterns, the novel methods will be able to capture narratives in a more holistic and intuitive manner. Expected outcomes include new modeling techniques grounded in theory and a tool to highlight biases with recommendations for diverse sets of news articles. By raising awareness to biased news reporting, the project will benefit Australians through more balanced public discourse on global challenges, such as climate change and health pandemics. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Systematic exposure to false or one-sided information has polarised society and hindered the response to crises ranging from climate change to health pandemics. In a culturally diverse country like Australia, a diverse media landscape is important. This project will develop techniques to detect systematic reporting biases in large collections of news articles. It will contribute tools and methods to expose these biases with the aim to better understand its nature, and increase media literacy. By incorporating social science theories of media bias into machine learning models, it will enable transparent and theoretically grounded bias detection at a large scale. On this basis, it will develop tools and a browser plugin as practical devices to promote awareness of media bias and a more balanced discourse around timely issues. The well-being of a liberal democracy critically hinges on a balanced public discourse incorporating diverse opinions. The tools and methods developed in this project will benefit Australia by understanding patterns of reporting bias and promoting a diverse news consumption. | | | | | |
| DE230100829 | **Geometric approaches to quantum many body problems** | 70,850.00 | 141,700.00 | 141,700.00 | 70,850.00 | 425,100.00 |
| Hackl, Dr Lucas F | The project aims to utilise results from differential geometry and related areas to investigate the physics of interacting many-body quantum systems. This project expects to generate new knowledge in the area of mathematical physics with broad applications in quantum information, condensed matter physics and statistical mechanics. The key focus will lie on the development of variational methods for the efficient simulation of quantum evolution and the characterisation of suitable quantum state families by their correlation structures. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The quantum properties of matter are a fundamental aspect of physics that explain aspects of the world such as light. Understanding of these properties allowed invention of lasers and transistors, and the ability to control and exploit matter at a quantum level underpins a wide range of potential technologies such as new kinds of computing. However, current computational models of quantum properties often cannot describe complex interactions between, for example, multiple atomic particles. This project will develop new mathematical methods to understand the quantum properties in these complex cases. Potential benefits include design of materials for applications such as efficient solar power, or simplification of the technology needed to underpin quantum computing. The project is therefore well aligned with Australia's strategic $100 million investment in quantum technologies and has the potential for commercial benefits in fields such as telecommunication, artificial intelligence, and manufacturing. | | | | | |

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| DE230101021 | **Developing tunable nanoporous graphene membranes for resource recovery** | 72,500.00 | 145,000.00 | 145,000.00 | 72,500.00 | 435,000.00 |
| Villalobos, Dr Luis Francisco | This project aims to advance the development of atom-thick nanoporous graphene molecular filters (membranes) to tackle challenging separations in the chemical industry and open new pathways to recover valuable materials from waste streams. The extreme thinness of these membranes allows them to separate molecules with a fraction of the energy typically used by commercially available technologies. The proposed electrochemical platform is expected to fabricate and operate fit-for-purpose membranes with unprecedented control. Significant new knowledge in the areas of material engineering, nanofluidics, and membranes is expected from exploiting this platform to study ion transport under confinement and make membranes for resource recovery. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Membrane technology is a versatile technology for the mechanical separation of substances; examples of its application include haemodialysis in artificial kidneys and purification of waste water. Current state-of-the-art commercial membranes for separations can remove particles from liquids but cannot select which particles are removed. This project builds on prior research that identified nanoporous graphene as a promising material for making membranes to select targeted molecules from a mixture. While graphene is an extremely thin impermeable barrier, this project will focus on developing technology to transform it into a membrane filter by drilling tiny pores of any size on demand. These filters could be used in resource recovery from waste, such as sewerage, mining and e-waste, which contain valuable resources such as fertilizer, lithium, gold and rare earth minerals. Advancing resource recovery will bring significant benefits to the Australia economy and environment and contribute to our resource security and independence. | | | | | |
| DE230101069 | **Awakening giants in galaxies: Using stars to probe supermassive black holes** | 72,266.50 | 144,438.00 | 144,343.00 | 72,171.50 | 433,219.00 |
| Auchettl, Dr Katie | This project aims to understand the unexplored population of non-active or quiescent supermassive black holes (SMBHs) using tidal disruption events - the multi-wavelength outburst resulting from a star being ripped apart by the tidal forces of the SMBH. This project will increase our understanding of the transient and accretion properties of SMBHs in a broad range of galaxies, while the expected outcomes include novel techniques for distinguishing different types of extreme SMBH emission and characterisation of the environments where these extreme transient events occur. These outcomes will facilitate the identification of transient SMBH events and enhance the scientific return of the next generation of international optical surveys. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Super massive black holes play an important role in the life of galaxies as they are vital in star death and birth. This project will study the deaths of stars as they are eaten by supermassive black holes at the centres of galaxies, providing insights into the evolution of galaxies. The data-analysis skills developed in this project will be of benefit in other data-intensive industries such as finance and technology, enhancing innovation in these fields. Outcomes include ensuring Australia continues to play a leading international science role in the era of big-data astronomy, capitalising on the Australian Government's significant investments in astronomical science facilities. The project will provide cultural benefit by leveraging public interest in black holes to encourage future generations to pursue education and careers in science and technology, just as projects such as the Hubble and James Webb telescope have done previously. | | | | | |
| DE230101079 | **New insights into how the brain interprets visceral and somatic sensations** | 72,147.50 | 149,556.00 | 154,616.50 | 77,208.00 | 453,528.00 |
| McGovern, Dr Alice E | Sensory nerve fibres monitor normal and abnormal stimuli in our body tissues, sending this information to the brain. I study the sensory pathways of the respiratory system which protect the lungs from harmful stimuli, such as inhaled pollutants or smoke. I discovered that respiratory sensory pathways interact with sensory circuits in the brain arising from other body tissues. The goal of this project is to investigate one example of this interaction; the convergence of visceral and somatic sensory pathways onto a brain circuit that regulates the intensity of the sensations that are experienced. This project addresses the fundamental question of how the brain processes two competing noxious sensations. | | | | | |

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| | **National Interest Test Statement**<br>Our nervous system reacts to harmful factors in the environment by activating different response pathways to protect us from harm. However, it is unknown how the brain prioritises different harmful factors experienced simultaneously in different parts of the body. For instance, protective responses to inhaled pollutants perceived by the lungs are different from the responses (e.g. pain) to sensory stimuli experienced by other tissues. New models and technologies that trace specific nerve pathways will help resolve these different nerve networks and how they interact with each other allowing the brain to prioritise the responses. New knowledge of nerve pathway interactions that protect individuals from harm, will inform our fundamental understanding of behaviour and assist the design and implementation of potential interventions. Project discoveries will create new knowledge, intellectual property and national capability in neuroscience. Translation of innovation will be supported by Venture Services in our Research, Innovation and Commercialisation office. | | | | | |
| DE230101165<br>Shapiro, Dr Jacob Z | **Geometric Scattering Theory, Resolvent Estimates, and Wave Asymptotics**<br>This project aims to understand how fast the local energy of a wave decays when it propagates in a rough, open system. This projects will generate new knowledge in the mathematical subfields of microlocal analysis and partial differential equations by refining tools such as Carleman estimates, separation of variables, b-vector field analysis, and quasimode constructions. The expected outcome of this project is a novel and comprehensive mathematical treatment of wave propagation in systems with weaker than Lipschitz regularity. This research should provide significant benefits such as informing predictions about waves in rough systems, including the propagation of seismic waves, and lead to advances in medical and geological imaging. | 71,100.00 | 140,260.00 | 138,610.00 | 69,450.00 | 419,420.00 |
| | **National Interest Test Statement**<br>Monitoring and interpretation of waves as they travel through their environment is essential to a range of fields. For example, seismic waves from earth tremors can be used to image the interior of the Earth while hospital imaging devices such as MRIs use waves in magnetic fields as a basis of medical diagnosis. However, interpretation of the waves relies on assumptions about the body they are passing through. Currently it is often assumed that the body is uniform but in real environments (known as rough, open systems) waves travel, change and eventually die. This project will develop the new mathematics needed for these environments and will help to improve these critical health and safety technologies. The methods also have applications such as cloaking objects from electromagnetic detection as well as in photography, facial recognition, and advanced microscopy, all of which are areas where Australian industry can directly benefit. | | | | | |
| DE230101175<br>Dooley, Dr Kate | **Contested Geographies of Terrestrial Carbon**<br>National pledges to tackle climate change rely heavily on land to sequester and store carbon. How competing ideas about land use are negotiated and institutionalised in the climate regime is critical to effective, just and legitimate climate responses. This project aims to explain the political economy of the science and policy of land-based climate mitigation, generating new knowledge on who promotes carbon sinks and why. The expected project outcomes include guidelines to advance more just and sustainable land use through improved carbon accounting practices, using an innovative approach that combines stakeholder interviews, discourse analysis, and expert elicitation. These outcomes will notably benefit rural communities and farmers. | 71,609.50 | 142,670.00 | 143,262.50 | 72,202.00 | 429,744.00 |
| | **National Interest Test Statement**<br>The land sector is central to delivering Australia’s Long-Term Emissions Reduction Plan for lowering CO2 emissions. Proposals for carbon removal and offsetting by sequestering carbon in soil, agricultural crops or forests need to be credible and legitimate to effectively contribute to tackling climate change and to garner wide public support. This project will study the political economy, science and the policy agenda to keep carbon out of the atmosphere through these “carbon sinks”. The project outcomes will unravel the logical underpinnings of land-based climate mitigation, including carbon sinks, leading to sustainable land use and improved carbon accounting practices. These goals will be achieved using a combination of stakeholder interviews, discourse analysis, and broad consultation. The project will have social benefit, particularly in rural communities involving farmers, by communicating how competing ideas about land use are negotiated and institutionalised in the process of creating effective, fair and legitimate climate responses. | | | | | |

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| DE230101204 | **Digital citizenship and girls' gender empowerment** | 72,358.00 | 147,036.00 | 144,069.00 | 69,391.00 | 432,854.00 |
| Beta, Dr Annisa R | Employing youth participatory action research in Indonesia, this project investigates the digital tools, resources, and strategies used by female youth to advocate for social change. The existing strategies used by development organisations rely on traditional, top-down advocacy approaches, overlooking the innovative ways girls and young women in developing countries use digital technologies to teach one another about gender-based violence and empowerment. Expected outcomes include youth-centred digital strategies and publicly accessible resources. The project's findings will be used to improve the design of gender empowerment programs that can be scaled up to enhance the Australian government's aid distribution. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Young people increasingly use digital communication to connect with their peers. This new generation of 'digital citizens', also use digital tools, such as social media, to influence social values, such as greater awareness of environmental issues. But we do not know enough about how these digital strategies achieve positive social changes. This project will explore how young women use digital media to advocate for gender equality, particularly approaches to reduce gender-based violence. It focusses on young people in Indonesia, a country of strategic importance for Australia, and will provide evidence on youth civic engagement and digital learning that is relevant to policy makers and aid agencies in deciding funding priorities to support equity initiatives. Outputs will include accessible resources for NGOs and agencies to support youth-led and digital programs for gender equity. Findings will have potential applications for youth and gender equity policy and programs in Australia. | | | | | |
| DE230101209 | **Linguistic discrimination and migrant youth in regional Australia** | 70,000.00 | 140,000.00 | 140,000.00 | 70,000.00 | 420,000.00 |
| Nguyen, Dr Trang | Linguistic discrimination is among the critical factors in migrant youth's dissatisfaction with their lives in regional Australia. This project aims to investigate migrant youth's experiences and management of such discrimination, and its impact on their linguistic citizenship (sense of belonging associated with language), using an interpretative research approach. Expected outcomes include new knowledge, theory development, and policy recommendations for supporting migrant youth to counteract such discrimination and empower them as more capable citizens. Expected benefits include improving migrant youth's wellbeing and their connection with regional areas, as well as enhancing understandings of linguistic discrimination in Australia. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Linguistic discrimination against migrant youth in regional Australia is a serious problem that discourages them from settling in the regions and feeling part of the community. This project will bring important social benefits to migrant youth populations, regional areas, and Australian society. It will generate new knowledge to inform policy and interventions to help reduce such discrimination, in order to improve youth's wellbeing and enhance their connection with regional areas. The project outcomes will also help inform strategies for improving social cohesion in the regions. The research will contribute to greater public understanding of linguistic discrimination and foster intercultural dialogue in today's Australia. The project will generate multiple strategic and practical outcomes, including academic publications, newspaper articles, a Language Equity booklet, and a research report, to deliver these benefits. | | | | | |
| DE230101210 | **Social Inequalities in Oral Health among Australian Working Age Adults** | 72,550.00 | 144,144.00 | 143,188.00 | 71,594.00 | 431,476.00 |
| Singh, Dr Ankur | Australian working age adults with social and economic disadvantage have significantly poorer oral health outcomes than those from advantaged backgrounds. This project explores how changes in social position over time, and interactions between different forms of social disadvantage, contribute to social inequalities in oral health. This project expects to improve understanding of social inequalities in oral health, and its solutions, by developing and applying analytical and simulation models. This will help identify ways to reduce the persistent social inequalities in oral health outcomes in working age adults. In doing this, it will inform policies in future that will significantly improve the well-being of Australian working age adults. | | | | | |

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

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| Approved Organisation, Leader of Approved Research Program | Approved Research Program | Estimated and Approved Expenditure ($) | | | Indicative Funding ($) | Total ($) |
|---|---|---|---|---|---|---|
| (Columns 1 and 2) | (Column 3) | 2022-23 (Column 4) | 2023-24 (Column 5) | 2024-25 (Column 6) | 2025-26* (Column 7) | (Column 8) |
| | **National Interest Test Statement**<br>Poor oral health can be disabling. It can cause problems with eating, speaking and sleeping and can have detrimental impacts on a person's self-esteem, earning potential, health and well-being. Poor oral health outcomes are often associated with poverty and other markers of lower socio-economic status such as income, education, and occupation. This project will analyse how changes in the socio-economic status of Australian working age adults affect their oral health and will develop models to increase the understanding of how these factors interact. These models will help identify the most effective interventions, providing relevant government agencies with additional data to inform decisions about the investment of finite public money for maximum social and health benefit. The insights provided through this project will reduce entrenched disadvantages suffered by Australians from lower socio-economic backgrounds. | | | | | |
| DE230101315<br>Garside, Dr Victoria C | **The dynamic interplay between the matrix and cell fate in developing heart**<br>Malformations in the developing heart can lead to catastrophic defects and embryonic loss. The valves play a critical role in blood flow regulation and are made of a stratified matrix that is laid down early in development. This project aims to determine how the cellular fate of the early valve cells establish the layered matrix and in turn how the matrix can influence cell fate by utilising a multi-omics approach to identify unique cell populations and integrate transcriptional and protein changes during matrix disruption. This project expects to generate fundamental knowledge on how matrix structure can influence cell fate in the valves and will advance Australia's knowledge base and research capabilities in developmental biology. | 78,359.00 | 154,718.00 | 152,218.00 | 75,859.00 | 461,154.00 |
| | **National Interest Test Statement**<br>Heart formation involves interactions between developing cardiac cells and their tissue environment, a process that can go wrong leading to cardiac abnormalities. Congenital heart disease is a significant burden for the affected individuals, their families, the healthcare system, and the economy. Using the heart as a model, this project will explore how developing cells interact with the tissue environment to direct cellular identity and healthy organ formation. The research will examine how the tissue environment affects gene and protein expression underpinning development and differentiation of heart cells. The outcomes will build research skills and capability in developmental biology and lay the foundations for the potential creation of novel diagnostics and therapeutics for the treatment of childhood heart disease, a leading cause of death and hospitalisation in infants. | | | | | |
| | **The University of Melbourne** | 1,576,520.00 | 3,163,795.50 | 3,177,362.00 | 1,590,086.50 | 9,507,764.00 |
| | **Victoria** | 4,815,122.50 | 9,668,148.00 | 9,611,106.50 | 4,758,081.00 | 28,852,458.00 |

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| **Western Australia** | | | | | | |
| **Curtin University** | | | | | | |
| DE230100078 | **Controls on the severity of past environmental crises** | 75,000.00 | 150,000.00 | 145,000.00 | 70,000.00 | 440,000.00 |
| Olierook, Dr Hugo K | This project aims to investigate how the rate of volcanic volatile emissions controlled the severity of past environmental crises. Catastrophic mass extinctions and major oceanic anoxia events are principally caused by the emplacement of gigantic volcanic eruptions but the volume of magma does not correlate with environmental severity. This project couples high-precision age and volatile emission measurements to model distinct climatic perturbations over Earth's last 540 million years. The intended outcome is to find a root cause for severity of past environmental crises, with past emission rates to be used as tools to model possible future climatic crises and provide a new fundamental understanding of Earth's magmatic engine. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Past volcanic eruptions have the potential to help us understand the current man-made climate change. This project will measure the rate and associated volatile emissions of past volcanic eruptions. These data will inform modelling of past environmental catastrophes and their effect on climate change. These findings will be directly applicable to future climate models. Volcanic eruptions also host valuable minerals, including nickel, cobalt and the platinum group elements. A fifth of these gigantic volcanic eruptions occurred in Australia and shaped its mineral endowment. Nickel alone accounts for more than $2 billion of Australia's economy. A foundational knowledge of the eruption rate of gigantic volcanic eruptions will aid in future mineral exploration and will be made available to multiple stakeholders, including mineral exploration companies that already collaborate with the lead investigator and his wider team. Additionally, the findings of this work will facilitate Australia's green energy transition by providing invaluable information on critical minerals and aiding to successfully mitigate man-made climate change. | | | | | |
| DE230100123 | **Digital Twin to Manage Safety in Large-scale Transport Infrastructure Asset** | 72,553.00 | 143,106.00 | 141,106.00 | 70,553.00 | 427,318.00 |
| Fang, Dr Weili | This project aims to improve safety during the construction of transport assets by integrating the Internet of Things with image processing technologies to develop a digital twin framework. The developed framework will provide the construction organisations with the ability to create strategies and solutions needed to improve the safety of construction in real-time. The outcomes of this project will aid effective decision-making and thus enable the managerial actions required to eliminate workplace accidents. Improving safety performance not only augments productivity but also allows the economic and social benefits of transport infrastructure assets to be realised. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | This project aims to improve safety during the construction of transport infrastructure projects. Safety management is inefficient as it is traditionally labor-intensive, rendering it difficult to identify and manage safety risks on-site. Advances in Artificial Intelligence, particularly deep learning and the Internet of Things, can help address this problem. This project will integrate data with image processing technologies to develop a virtual model of a physical construction site to manage safety. Successful completion of this project will enable construction organizations to improve and better plan safety on their sites. Improved safety will enhance the productivity and performance of construction projects, lower injury/illness costs, reduce absenteeism and turnover, raise employee morale, and thus ultimately increase productivity and quality. The technology developed in this project will be made available to construction organizations to monitor, control, and manage safety risks enabling them to implement continuous improvement strategies | | | | | |

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| DE230100171 | **Integrated models of learning and decision making in complex tasks** | 73,713.50 | 146,243.50 | 145,566.50 | 73,036.50 | 438,560.00 |
| Strickland, Dr Luke J | How do people learn to make decisions in complex work systems when assisted by automation? This project will develop computational models of human learning and decision making that explain and predict complex decisions relevant to industries such as aviation and defence. It will examine how humans learn to use automated advice, how learning affects remembering to perform planned (deferred) actions, and factors that pose a risk to learning and adaptation. The expected outcome is a significant theoretical advance in human factors and cognitive psychology, and a tool for informing work design (e.g., computer interface, task allocation) and training, with the potential to reduce human error in safety-critical workplaces. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | As Australian workplaces become more complex, employees are increasingly required to work with automated systems to manage high workloads. Furthermore, due to high workloads, employees often need to defer tasks and remember to perform them in the future. There is an urgent need to understand human decision making and its limitations in such work contexts in order to enhance performance and prevent workplace errors. This project will develop models that explain and predict how people learn to make decisions in complex tasks. The proposed models can inform work design and training, increasing the safety and efficiency of Australian workplaces. Industries in which operators must make safety-critical decisions will benefit, including aviation and national defence. The proposed models will inform the design of decision support tools and automated systems that have potential to predict and prevent human errors in “real time”. The project will provide opportunities for training students and early career researchers, enhancing Australia’s capacity at the intersection of human factors and cognitive psychology. | | | | | |
| | **Curtin University** | 221,266.50 | 439,349.50 | 431,672.50 | 213,589.50 | 1,305,878.00 |
| **Edith Cowan University** | | | | | | |
| DE230101520 | **Work fragmentation in the gig economy** | 61,303.00 | 129,295.00 | 126,483.50 | 58,491.50 | 375,573.00 |
| Barratt, Dr Tom | The gig economy has fragmented working arrangements in Australia and globally, disrupting how, where and on what terms work is performed. This study will systematically interrogate the consequences for work and workers in Australia of the growth and diversification of gig work. It will use a labour geography approach to explain how workers navigate working in the gig economy in the context of their wider lives. This will extend existing research by grounding analysis in the lived experience of workers both across various segments of the gig economy and over time. The project will extend academic theory and provide guidance to policymakers as to how to harness the benefits of gig work while mitigating potential harm. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The 'gig economy' has recast the nature of work relationships and performance in the Australian economy. This has re positioned workers, simultaneously increasing work opportunities and creating the potential for the exploitation of workers. This project will investigate the experience of work in the gig economy, using geographical and industrial relations frames to show how, why, where and when workers engage in gig work, and what this means for their work and non-work lives. This is of benefit as the regulation of the gig economy is a live political issue, with Parliaments and regulators (primarily the Fair Work Commission) currently deciding the best way to maximise the economic and social benefit of the gig economy for Australia and workers in Australia. By providing a robust, multi-sector and longitudinal data set which will report the motivations, expectations, needs and experiences of gig workers, this project will inform these regulatory choices. | | | | | |
| | **Edith Cowan University** | 61,303.00 | 129,295.00 | 126,483.50 | 58,491.50 | 375,573.00 |

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| **The University of Notre Dame Australia** | | | | | | |
| DE230101382 | **Nature-culture continuities in medieval philosophy and theology** | 68,359.00 | 136,718.00 | 136,718.00 | 68,359.00 | 410,154.00 |
| Lyons, Dr Nathan E | While nature and culture tend to be opposed to one another in modern philosophy, in medieval thought there are many continuities between the two domains. This project will provide the first sustained historical study of nature-culture continuities in medieval Latin philosophy and theology, examining the areas of: cognition; language; semiotics; ethics and politics; animality; ecology; metaphysics; and God. The project will fill a significant gap in medieval intellectual history, enhance Australia's research capacity in the history of philosophy and history of theology, and demonstrate how medieval ideas can inform contemporary debates about humanity's relationship to the natural world. | | | | | |
| | **National Interest Test Statement**<br>The relationship between humanity and the natural world is one of the most fundamental questions of human inquiry, and it is especially urgent today. This project will offer new perspectives on this nature-culture issue, drawn from historical sources that are largely forgotten today. Many medieval thinkers see human beings as more deeply embedded in the natural world than we usually think in the modern era, and despite their historical distance from us (or perhaps because of it), they can inform our thinking about nature in significant and surprising ways today. The project will demonstrate the value of the humanities, alongside the work of the natural sciences, for thinking through the problems related to nature and the environment that confront Australians today. It will give Australians new insights into ideas that emerged in medieval Europe, which continue to profoundly shape our society and our values. The project will also benefit religious groups in Australia by showing how religious traditions can serve as productive sources for deliberating about issues of contemporary social concern. | | | | | |
| | **The University of Notre Dame Australia** | 68,359.00 | 136,718.00 | 136,718.00 | 68,359.00 | 410,154.00 |
| **The University of Western Australia** | | | | | | |
| DE230100579 | **The existence and abundance of small bases of permutation groups** | 73,909.00 | 148,018.00 | 148,968.00 | 74,859.00 | 445,754.00 |
| Lee, Dr Melissa C | This project aims to study bases for permutation groups, which are the mathematical formalisation of symmetry. Bases are crucial to encoding and computing with groups in diverse areas of science. Small bases are desirable for efficiency, but can be hard to find. This project expects to combine techniques from areas of algebra and probability to determine the existence and abundance of bases. Expected outcomes of this project include new methods to address enduring open problems in the study of bases, as well as novel applications of existing techniques. This should provide significant benefits, such as creating and strengthening international collaborations, and building on Australia's reputation as a powerhouse of finite group theory. | | | | | |
| | **National Interest Test Statement**<br>Symmetry is the fundamental organising principle which governs everything from the chemical properties of molecules to the fundamental laws of physics. The mathematical study of symmetry, called group theory, is also key for cutting-edge technological advances in areas such as machine learning, autonomous vehicles and cybersecurity. For all of these applications, it is important to be able to compute with groups. Many of the algorithms for calculating fundamental properties of collections of symmetries, which we call groups, rely on computing an object called a base for each group. Quantifying the computational cost in finding bases lies at the heart of this project. The understanding gained through this research will inform implementation of group theoretic software packages, which will have flow-on effects to other areas of science and technology. This important work will therefore also benefit Australia's broader scientific community. It will also strengthen key international research links by attracting world-leading experts in theoretical and computational group theory, leading to new collaborations. | | | | | |

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| DE230100954 | **Partial Differential Equations, geometric aspects and applications** | 58,328.00 | 116,806.00 | 119,156.00 | 60,678.00 | 354,968.00 |
| Poggesi, Dr Giorgio | The study of Partial Differential Equations (PDEs) is a classical and prolific field of research having a fundamental role in the development of mathematical analysis and motivated by important applications in natural and applied sciences. This project aims to obtain substantial progress in the field of PDEs. The area of mathematical research covered is extremely broad, at the confluence of analysis and geometry, and with many applications to other areas of mathematics and natural and applied sciences. The results that will be obtained will produce a significant amount of new knowledge in this extremely difficult, but rapidly growing, field, by exploiting international scientific collaborations and interdisciplinary methods. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | Partial differential equations are a cutting edge and rapidly growing area of mathematics which are critical to our fundamental scientific understanding of thermodynamics, sound, fluid flow, and other real world phenomena. This research will result in new solutions for mathematical problems that will develop Australia's capability in mathematical theory and, importantly, may underpin new scientific applications. The possible applications of this research are far-reaching, including finding shapes which enclose a space while minimising the surface area, potentially minimising construction costs of buildings. This research may result in economic benefits to Australia as better understanding of applied science concepts may lead to technological improvements in materials science (coating of composite materials) and other fields. Adoption of the results of this research will be driven through communication and collaboration with colleagues in other relevant applied scientific fields including materials science and engineering. | | | | | |
| DE230100978 | **A new Iron Age! Making Iron complexes fit for C-C cross-coupling catalysis.** | 71,553.00 | 138,981.00 | 131,856.00 | 64,428.00 | 406,818.00 |
| Korb, Dr Marcus | This project aims to develop new iron catalysts as alternatives to the expensive and increasingly rare noble metals currently used in C-C bond forming reactions, the most important single-step in the fine-chemicals sector. This project expects to create a flexible yet robust framework by introducing a hemilabile ligand into the backbone of the iron complex to control the number of vacant coordination sites. Expected outcomes of this project are 1) iron complexes able to catalyse biaryl couplings from sustainable substrates and 2) knowledge on structure-property relationships of iron-based catalytic processes. Australia will benefit by applying its own resources and help preserving the valuable noble metals for processes relying on them. | | | | | |
| | **National Interest Test Statement** | | | | | |
| | The formation of new bonds between two carbon atoms is the most essential step in the production of many chemicals, including pharmaceuticals. These reactions currently require the use of expensive metals that act as catalysts to speed up the rate of a chemical reaction, but these are not easily available in Australia and must be imported at high cost. This project aims to develop alternative catalysts based on iron, which is cheaper, more environmentally friendly, and widely available in Australia. Expected outcomes of this project will be development of new and efficient iron catalysts that can be easily produced in Australia from local iron ore resources. These catalysts are likely to be adopted immediately by the Australian chemical manufacturing industry because they are cheaper and locally available, improving the supply chain for manufacturing chemicals in Australia and strengthening our economy. | | | | | |
| DE230101058 | **Glass-box Deep Machine Perception for Trustworthy Artificial Intelligence** | 75,859.00 | 147,243.00 | 142,768.00 | 71,384.00 | 437,254.00 |
| Akhtar, Dr Naveed | Explainability and Transparency are the key values for development and deployment of Artificial Intelligence (AI) in Australia's AI Ethics Framework for industry and governments. This project aims to build new tools to make the central technology of AI - deep learning - transparent and explainable. Its expected outputs are novel theory-driven algorithms and unconventional foundational blocks for deep learning that will allow humans to clearly interpret the reasoning process of this technology, which is currently not possible. It is expected to significantly advance our knowledge in machine intelligence and perception. Due to their fundamental nature, the project outcomes are likely to benefit industry and scientific frontiers alike. | | | | | |

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| | **National Interest Test Statement**<br>Australia's Artificial Intelligence (AI) Ethics Framework guides businesses and governments to responsibly develop and deploy AI. A key principle of this framework is 'Transparency and explainability' of AI, which also has significant implications for Australian Government's AI Action Plan. Currently, the most promising technology in AI, i.e. deep learning, is neither transparent nor explainable. This project aims to address this by making this technology inherently human-interpretable. It strongly complements the Government's strategic vision "to establish Australia as a global leader in developing and adopting trusted, secure and responsible AI." AI is expected to contribute more than 20 trillion dollars to the global economy by 2030. Australian Government's AI Action Plan is a key feature of its Digital Economy Strategy to seize this opportunity. By enabling the central technology of AI to conform to Australian AI guidelines for businesses and governments, this project is expected to have a significant downstream economic, commercial and social impact on the Australian community. | | | | | |
| DE230101231<br>Foo, Dr Yong Zhi | **The effect of nutrition on male life history traits in humans**<br>This project will provide answers to fundamental questions in evolutionary biology while identifying diet compositions that will benefit human health and well-being. Using a longitudinal public-health database, the Raine Study, and a theoretical framework from the field of Nutritional Ecology, the project will provide new knowledge on how nutrition affects key life-history traits in humans including immune function, reproductive health, physical appearance, and healthy ageing. A systematic literature review on how diet impacts these life-history traits in animals generally, and an experimental study of the effect of diet on health and reproduction in the house mouse (a lab analog species for humans) will complement the Raine Study findings. | 69,099.50 | 132,702.50 | 126,048.00 | 62,445.00 | 390,295.00 |
| | **National Interest Test Statement**<br>The world is facing an emerging crisis in healthcare, driven in large part by changes in human diet. The annual economic cost of treating diet-linked diseases, such as cardiovascular disease and diabetes, is estimated to be $2 billion in Australia. We will analyse dietary and health data from one of the world's most comprehensive public-health databases, The Raine Study (2,900 pregnant women and their babies commencing in 1989), complemented with a study of the effect of diet on health in laboratory mice. Outcomes will include novel insights into the management of diet-related illnesses by identifying the precise optimal ratio of nutrients that maximize health. Positive findings will provide insight for dietary interventions to extend the number of years during which Australians can lead healthy lives, thus providing economic and social benefits to Australia. These outcomes would be translatable through public health promotion, health organisations, and media. | | | | | |
| | **The University of Western Australia** | 348,748.50 | 683,750.50 | 668,796.00 | 333,794.00 | 2,035,089.00 |
| | **Western Australia** | 699,677.00 | 1,389,113.00 | 1,363,670.00 | 674,234.00 | 4,126,694.00 |
| | | **14,406,334.50** | **28,767,348.50** | **28,489,107.00** | **14,128,093.00** | **85,790,883.00** |

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