Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)

Australian Capital Territory

The Australian National University

DP240100013	**Mixed-Metal Clusters for Catalysis and Optical Applications**	87,339.00	174,678.00	174,678.00	87,339.00	0.00	0.00	524,034.00					
Humphrey, Prof Mark G	This project aims to afford new heterometallic molecular materials as precursors to catalysts and as new optical materials, exploiting oxophilic and carbophilic transition metal atoms for synergistic cooperation in certain catalytic processes, and using the polarity of heterometallic bonds to achieve strong optical limiting. Expected outcomes of this project include cluster structure/composition - catalysis/optical properties correlations that will signpost the route to efficient catalysts and optical limiters. This Project should provide significant benefits such as chemoselective catalysts needed for pharmaceutical drug and agricultural chemical production, and broad temporal range optical limiters needed for optical device protection.											
	National Interest Test Statement												
	Australia has amongst the world's largest reserves of certain critical metals used in the creation of chemicals in the medical and agricultural industries. However, we currently import many of these chemicals at high cost and with related supply risks. This project seeks to develop new chemicals by combining particular metals that are found naturally in Australia. It will develop these technologies 'at home' in Australia to boost commercial gain by domestic chemical manufacturers who can add value to our natural resources. These new chemicals will speed up chemical reactions, resulting in faster development times of medicines and agricultural chemicals. Given Australia's unique reserves of these strategic metals, our new technologies will support Australian chemical manufacturers to develop their commercial potential, and in turn enable home-grown industries to provide a lower-cost and local supply of key materials needed in our modern economy.											
DP240100108	**Thwarted Identity: The Missing Link Between Psychopathology and Prejudice**	54,373.00	152,180.00	197,684.00	198,490.50	130,815.50	32,202.00	765,745.00			England, Scotland, New Zealand		
Cruwys, A/Prof Tegan	Prejudice and the extremist violence that arises from it are typically explained either by the psychopathology of individual perpetrators, or by their membership of extremist groups. This project will seek to reconcile these competing explanations and resolve this impasse that has obstructed progress in combating prejudice. This project develops a new framework specifying causal and reciprocal links between the novel concept of thwarted identity, psychopathology, ideology, and prejudice. Expected outcomes are new policy solutions and novel targets for interventions to reduce prejudice and extremist violence, which will deliver significant benefit by addressing these pernicious social problems.												
	National Interest Test Statement												

* 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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	Prejudice is estimated to cost Australia >$38 billion per year. Until now, efforts to manage and alleviate the effects of prejudice have been largely unsuccessful, as policymakers lack a model that can explain how psychopathology (e.g., paranoia) and membership in extremist groups interact in ways that lead to and maintain prejudice and the violence that can arise from it. To address this need, our project will develop a novel model that introduces the concept of thwarted identity – a state in which people feel excluded from a group to which they feel entitled to belong. This new approach will allow us to develop predictive models that can identify people at risk of extremist group membership, as well as design innovative evidence-based interventions to prevent radicalisation. We have established pathways to impact through partnership with frontline services (e.g., police, community sector, intelligence) that will facilitate the application of these innovations in future policy to help tackle prejudice, increase social cohesion, and prevent radicalisation and extremist violence. Due to the large scale and ubiquity of the problem, even modest improvements to programs and policies will deliver outsized social, health, and economic benefits.												
DP240100143 Hui, Dr Francis K	**Modern statistical methods for clustering community ecology data** This project will develop statistical methods and software for clustering community ecology data, and use them to analyse systematic survey and citizen science program data collected along the Great Barrier Reef. By doing so, the project will address the dearth of statistical classification techniques for high-dimensional, multi-response data with complex relationships. When the resultant clustering methods are used to construct bioregions and characterise species' environmental responses, they should significantly enhance evaluations of the impact of human activity and environmental change on coral diversity. Ultimately, these evaluations can underpin future decisions in the conservation and management of the Great Barrier Reef.	69,859.00	141,049.00	130,784.50	59,594.50	0.00	0.00	401,287.00					
	National Interest Test Statement The Great Barrier Reef is the largest coral reef ecosystem on the planet, contributing an estimated $6.5 billion in annual revenue and 64,000 jobs to the Australian economy. Climate change is responsible for an unprecedented decline in the health of the Reef's coral, posing the single most significant threat to its survival. Policymakers and practitioners currently struggle to make evidence-based decisions and interventions for the Reef's survival due to the limitations of existing statistical techniques used to analyse large, complex multi-species datasets. This project will create cutting-edge statistical methods to help practitioners identify how coral communities will evolve over space and time in response to climate change. The knowledge and translational tools developed will be shared with conservation managers and environmental policymakers in the form of user-friendly software to help them improve Reef health monitoring, evaluation, and resource planning, and more effectively respond to critical conservation and biodiversity concerns. These outcomes will enhance the development and implementation of Reef monitoring programs and management policies, leading to the improved long-term sustainability of one of Australia's 'wonders of the world' and vital economic assets.												
DP240100177 Nicotra, Prof Adrienne B	**What determines plant sensitivity to heat?: Individual to lifetime impacts** Temperature is a major determinant of the distribution of species and yet the capacity to predict the thermal sensitivity of plants is extremely limited. How vulnerability varies as a plant grows from seed to adult and produces more seed is a key question. Whether chronic warming exacerbates or ameliorates effects of extreme events, e.g. triggering the plant to enlist defensive strategies, is also an open question. This project will advance fundamental understanding of how thermal tolerance varies across species and over the plant life cycle and how it scales demographically to lifetime vulnerability. The work will yield a significant advance in our capacity to predict impacts of extreme heat events on plant performance and distribution.	55,927.50	176,972.00	259,761.00	138,716.50	0.00	0.00	631,377.00			Chile		

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	National Interest Test Statement It is difficult to predict the effect that increasingly frequent extreme heat events will have on Australian plants, though we know temperature can define where a species can survive. To manage Australian biodiversity in the face of rapid climate change natural resource managers and policymakers need good predictions of how extreme heat will affect plant species. The Australian National Botanic Gardens, with its thousands of seed collections and living plants provides a fantastic resource to study how extreme heat affects plants as they grow from seed to seedling to adulthood. We will assess the sensitivity of these different stages to extreme heat and will develop models to assess how Australian plant species will respond to a warmer, more variable climate. Our work will help natural resource managers to predict which species will be most sensitive to extreme heat events and where in Australia those impacts will occur. This will lead to informed policies and management plans to aid conservation of threatened species and will help Australia reach its biodiversity conservation targets. Effectively managing Australian plants under increasingly warm and variable weather conditions will have broad environmental and economic benefits. It will improve capacity to retain biodiversity and maintain health of our natural systems. Our work will assist Australian natural resource managers and policymakers to plan and manage native plant species in a time of rapid environmental change.												
DP240100187 Mahanty, Prof Sango	**Planet Chicken: Chemical Entanglements in Asia's Poultry Boom** This project aims to study the effects of Asia's rapidly expanding chicken meat industry on environmental degradation, social inequality, public health and animal welfare. Agricultural chemicals and veterinary drugs saturate this industry, with little regulation or data on types, quantities and applications. Deploying interdisciplinary methods at key nodes of the chicken value chain in India, Thailand and Vietnam, this study will 1) examine practices and market structures that shape chemical use and 2) uncover chemical presence and socio-ecological impacts. The project intends to expose how toxicity, biodiversity, and health interact with global food systems and to propose interventions for effective governance of factory farming in Asia.	103,118.50	248,811.50	232,998.00	87,305.00	0.00	0.00	672,233.00			Denmark, India, Thailand, Vietnam, Germany		
	National Interest Test Statement Asia has undergone a boom in chicken farming in the last decade - it provides 38% of the world's chicken meat for consumption. However, Asia's chicken farming industry uses drugs and agricultural chemicals that are largely uncontrolled which makes their export chicken meat a potential source of unsafe food, and a source of 'superbugs' and animal-borne diseases that may drive the next global pandemic. Focusing on three important producers (India, Thailand and Vietnam), this project will use social research and scientific assessments to understand which chemicals and drugs are used in maize farming, feed mills and factory chicken farms, and the risks that these chemicals and drugs pose for the safety and wellbeing of consumers and the chickens that are factory farmed. Through outreach activities such as workshops and accessible communication products, the project will engage the livestock industry and policymakers in Australia, India, Thailand and Vietnam to support them to design and implement viable and effective policies to better manage Asian meat production. Improved regulation of chicken farming and export in our region will benefit Australia by reducing livestock disease risks and economic loss, and protecting the health of Australians.												
DP240100207 Yaxley, Prof Greg M	**The carbonate geology of the critical metal niobium** This project aims to understand how pyrochlore, the major ore mineral of the critical metal niobium, forms in Earth's crust. Niobium is exclusively mined from carbonatite magma bodies in Brazil and Canada, despite proven Australian resources. It is used in high strength steel alloys in the construction and transport industries. Expected research outcomes include understanding how pyrochlore forms in carbonatites, development of exploration tools to locate niobium ore bodies which are unexposed at the surface, and investigation of environmentally and economically sustainable technologies for metallurgical extraction of niobium from ore. The research is intended to benefit	87,296.00	212,768.00	249,144.50	123,672.50	0.00	0.00	672,881.00			Germany, England		

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	Australia’s critical metals exploration and mining industries. **National Interest Test Statement** The project aims to determine how the critical metal niobium is concentrated in the Earth's crust to levels sufficient for economically viable mining. It will have significant economic benefits to Australia’s critical metals exploration, mining and manufacturing sectors. Niobium is an important commodity, used in the transport, pipe-line and construction industries, as well as in medical imaging equipment. Australia has known but unexploited niobium resources. Studies of Australia's geology indicate that it is highly likely more, undiscovered niobium deposits exist. This research will generate better understanding of how niobium deposits form in the Australian crust. New experimental data will allow development of exploration vectors, which will indicate the likely proximity of, and general direction to a niobium deposit buried deep in the crust, even in the absence of exposure at the surface. This will improve the chances of success in niobium exploration programs. It will also benefit the metallurgical extraction industry by investigating new, cheaper and environmentally more sustainable chemical technologies to extract niobium from its ore. There will be further benefit to the minerals industry and to Australian scientific research by training young, future research leaders in critical metals geology and metallurgical extraction, who will help translate research outcomes from academia to industry.												
DP240100273 Cox, A/Prof Nicholas J	**Protein Structure and Dynamics by Electron/Nuclear Paramagnetic Resonance** This interdisciplinary project aims to establish new magnetic resonance methods for the analysis of protein structure and motion at low concentrations and in physiological conditions that are otherwise difficult or impossible to study. It brings together four different research groups with expertise in advanced biochemistry, modern magnetic spectroscopy and high-performance computing. The project expects to develop tools to study protein structure, protein-protein association and protein-ligand interactions of established drug-targets. Expected outcomes include new techniques that quickly inform how drugs work, providing significant benefits to many researchers studying biomolecules, and supporting Australia’s growing biotechnology sector.	130,000.00	260,000.00	260,000.00	130,000.00	0.00	0.00	780,000.00			United States of America, England, Germany		
	National Interest Test Statement Pharmaceutical research routinely employs nuclear magnetic resonance (NMR) spectroscopy to verify the binding of drugs to their intended targets. This project aims to develop better magnetic resonance techniques to accelerate the early stages of drug discovery. It will combine innovative biochemistry, modern magnetic resonance spectroscopy, in particular electron paramagnetic resonance (EPR), and high-performance computing to accelerate the detection of drug candidates with their target, both inside and outside cells. Results will inform medicinal chemists on the activity and possible side effects of drug candidates and how they can be improved. This project will support Australia’s fast growing biotechnology sector by accelerating the rate with which these companies can secure intellectual property and help to establish a sovereign capacity in the development and manufacture of drug therapies.												
DP240100281 Brocks, Prof Jochen J	**Molecular fossils, mass extinctions and the rise of complex algae** This project aims to illuminate the fate and role of phytoplankton during the Permo-Triassic crisis, the most severe mass extinction event in Earth's history. Despite being the vital driving force of the carbon cycle, these microscopic yet essential organisms have largely evaded fossilization and their precise history remains unknown. Leveraging innovative molecular fossil technology, this project seeks to unlock this critical information, generating insights into the mechanisms behind climate-driven mass extinctions and the subsequent recovery of marine life. By doing so, this study aims to reveal how current disruptions to the base of the food chain may escalate through all levels of	91,736.50	202,082.50	203,198.50	92,852.50	0.00	0.00	589,870.00			England, Japan, Canada, Switzerland		

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	marine ecosystems, causing extinction. **National Interest Test Statement** We live in a period of dramatic ecological change. Rising temperatures, nutrient discharge into the oceans and removal of important species from ecosystems already have massive impact on Australia's marine life. Yet, we lack knowledge about the role of one of the most essential drivers of ecosystems collapse, microalgae and cyanobacteria. These small but critical organisms form the base of the foodweb, generating all energy and carbon that flow through marine ecosystems. However, rising water temperatures can lead to the collapse of this phytoplankton, resulting in blooms of disaster species that produce toxins and deplete oxygen levels. The collapse at the base of the food chain may drive oceans towards tipping points and cause animal extinction. This project aims to illuminate the role of these carbon fixing organisms during the most severe mass extinction event in Earth's history that was triggered by global warming 252 million years ago. The project endeavours to benefit Australia by bridging a massive gap in knowledge about how its marine ecosystems may respond to current and future perturbations, raising the public's understanding how even small disruptions at the base of the foodweb may escalate through all levels of marine ecosystems. Ultimately, this research will contribute information for policymakers and industry to make informed decisions towards safeguarding Australia's environment and preserving its marine life for future generations.												
DP240100400 Klein, Prof Colin	**Finding equivalence between natural and artificial intelligences** This project aims to investigate the ways in which artificial intelligence is equivalent to human intelligence. Computers outperform humans in many domains, yet it is clear that computers often don't perform tasks the way humans do. Developing innovative methods for evaluating claims of equivalence by drawing on simpler, well-understood model systems like the honeybee brain, the project expects to fill this existing knowledge gap. Expected outcomes include a framework that provides powerful, nuanced criteria for comparison of natural and artificial intelligences. Benefits are expected to include enhanced guidance for the development of AI systems both in everyday contexts and as exploratory tools in comparative and cognitive neuroscience.	93,771.00	183,479.00	124,028.00	34,320.00	0.00	0.00	435,598.00			England		
	National Interest Test Statement Artificial intelligence (AI) has the potential to revolutionize many Australian industries and sectors, including healthcare, transportation, manufacturing, and education. However, AI systems do not make decisions in the same way that humans do. Without a detailed understanding of the capabilities and limitations of AI, we risk both trusting AI when we shouldn't, and failing to use AI when we should. By combining insights from philosophy and neuroscience, this project will create the first set of principles for comparing natural and artificial intelligence. It will develop and disseminate best practice guidelines for determining how and where artificial intelligence might be applied. Through workshops that bring together government policy makers and industry working in AI, these tools will help to guide and inform future approaches to AI, reducing potential risks, and enabling the development of more cost-efficient and accurate artificial intelligence in Australia.												
DP240100506 Xie, Prof Lexing	**Interactions of Human and Machine Intelligence in Modern Economic Systems** Much of modern economic systems are driven by machine-machine and machine-human interactions that happens rapidly at large scale. But such interactions are often opaque and can have negative or catastrophic consequences, such as market plunges with no apparent economic reasons in financial trading, content recommendations that promote extremism, algorithms in gig economy leading to worker exploitation and wasted resources. This project aims for new theoretical results and algorithms at the intersection computational economics, game theory, and dynamical	91,294.00	170,588.00	169,263.00	89,969.00	0.00	0.00	521,114.00			United States of America, Singapore		

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	systems, that establish conditions under which the economic systems are stable, propose mechanisms that make the interactions more fair, transparent and aligned with human values. **National Interest Test Statement** Large-scale rapid interactions between algorithms and people are common place, such as financial trading, online ad auctions, ride-sharing and delivery services. Behaviours of these large economic systems are poorly understood, which has led to stock market flash crashes, delivery workers feeling dehumanised by algorithms, and large platforms gaining unfair advantages for their own products. This project aims to establish new theory and algorithms for promoting the stability and efficiency of online economies, and incorporate human values such as fairness, accountability and transparency. This project will build software tools to demonstrate and diagnose potential issues in online economic systems. With between 7% and 13% Australians participating in flexible employment including the gig economy, healthy and stable online economies will create jobs and help the long-term future of Australia. Through software demonstrations and dialogue with business and policy makers, this project will apply the new knowledge to help businesses responsibly design and use apps for online economy, and enable government to cultivate and regulate these important economic activities.												
DP240100534 Buchler, Prof Benjamin C	**Atomic sensors for dark matter, rotation and magnetic fields** This project aims to develop ultra-high-performance sensors. The research will explore new methods for using the magnetic and optical properties of atomic gases to enable multi-parameter sensing without crosstalk between measurements. It is expected that techniques will be developed to allow simultaneous sensing of rotation and magnetic fields using devices that are compact, ultra-precise and energy efficient. It is also anticipated that these new atomic sensors will support a global network looking for dark matter, which although never seen, is thought to make up 85% of the mass of the universe. The outcomes are expected to benefit medical science, geo-exploration, high-tech manufacturing, navigation and our understanding of the universe. **National Interest Test Statement** According to our current understanding, 85% of the universe's mass is made up of "dark matter", which has never been detected. Our project aims to develop ultra-high-performance atomic sensors that could find the missing dark matter and reshape our understanding of how the universe is made. Australia is the only country in the southern hemisphere that is part of a global collaboration called GNOME seeking evidence of this elusive mass, making our sensor station crucial for the network. Playing a role in this project means that Australian science will help shape humanity's understanding of the cosmos. The same atomic technology used in our dark matter sensor can be translated for the detection of rotation and magnetic fields. Ultra-high-performance sensing of these quantities is essential for geo-exploration, medical imaging, autonomous vehicle systems and navigation without GPS. Atomic sensors that harness methods developed for dark matter sensing could be more compact, cheaper and more energy efficient than currently available systems. The new techniques emerging from our research would be of great value to Australian high-technology manufacturing and defence industries.	136,794.00	162,429.00	51,020.00	25,385.00	0.00	0.00	375,628.00			United States of America		
DP240100687 Yin, A/Prof Zongyou	**Tuning catalyst reaction environments towards photoreforming of wastewater** This project aims to combine high-throughput computation and machine learning to screen photocatalysts more thoroughly for photoreforming of wastewater. The reaction environments effects on surface active units will be tailored for COx-emission-free selective organic synthesis with hydrogen production from organic-contained wastewater at	66,287.00	164,086.00	194,638.00	96,839.00	0.00	0.00	521,850.00			United States of America, Singapore		

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	ambient conditions. The project expects to expand our knowledge on the fast, reliable screening strategies, and the relationship between electric field (or lattice strain) and reaction pathways. This project will develop a photoreforming system for selective co-production of organics and hydrogen from wastewater, benefiting sustainable technologies development for chemical synthesis and hydrogen economy.												
	National Interest Test Statement												
	Hydrogen fuel produced from water splitting has the potential to replace fossil fuels in a sustainable economy. However, Australia's supply of clean water is vulnerable to droughts and may worsen due to climate change. To address this, this project aims to produce higher-value organics and hydrogen fuel from a more accessible and sustainable water resource, namely wastewater. The project will use high-throughput computation and active machine learning to screen multifunction-integrated photocatalysts efficiently. By designing catalyst reaction environments to tailor surface active reaction units, the project will develop triple-functions from one zero-emission process based on the photoreforming of wastewater. This will result in selective organic synthesis and hydrogen fuel production while suppressing carbon dioxide evolution. The project will leverage Australia's abundant solar resources to become a key green chemicals and renewable energy exporter. By developing patentable and commercially valuable intellectual property, the project will create new industry opportunities in the future. Overall, the project aims to couple hydrogen fuel production with environmental decontamination and global warming mitigation, leading to a sustainable future.												
DP240100747	**Investigating the world's first maritime network in Pleistocene Wallacea**	84,517.00	186,790.50	202,905.50	100,632.00	0.00	0.00	574,845.00			Germany, England, Indonesia		
O'Connor, Prof Susan L	This project will investigate the world's first maritime exchange network located in the islands to Australia's north. From ~16,000 years ago, tools made from exotic obsidian (volcanic glass) appear in the archaeological assemblages of three southern Wallacean islands, as do standardised items of personal decoration and fishhooks. Where the obsidian was acquired and how far the network extended are currently unknown. This project hopes to resolve this and determine how the network relates to other aspects of culture and changing sea levels. Through geological sourcing, geo-chemical analysis and multi-island excavations we will reveal the intensity and reach of this remarkable network to understand the origins of trade in our region.												
	National Interest Test Statement												
	Indonesia is one of Australia's most important economic and cultural partners today, yet our knowledge of the origins of trade across our region is unknown. This project will investigate the world's earliest maritime network in islands to Australia's north where volcanic glass began to be traded at least 16,000 years ago. Through an examination of the age and source of stone tools the project will uncover the origins of ancient trade, how far tools were moved over the sea, and the social and environmental factors that influenced early seafaring. The project benefit is to document and preserve significant cultural heritage sites in our region. By sharing results with the Indonesian and Australian public's, trade and cultural institutions – through media outlets and exhibitions – the project will deepen appreciation of how past maritime movements and cultural connections have influenced Australia and Indonesia.												
DP240100838	**Topological insulators and free fermions: from Hermitian to non-Hermitian**	89,294.00	178,588.00	141,158.50	51,864.50	0.00	0.00	460,905.00			England		
Batchelor, Prof Murray T	This project aims to develop and fully understand a class of mathematical models describing fundamental interacting systems of particles of central importance in the physics of topological insulators. This will include the extension of exact solutions to more complicated models and the development and application of topological data analysis for detecting												

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	topological phase transitions in these and more general materials. The project will also apply diagrammatic methods to address a long-standing challenge in solving a particular model. The project aims to contribute to training researchers in an area of the mathematical sciences of benefit to the future development of new concepts for next-generation electronic devices and smart materials. **National Interest Test Statement** The development of smart electronic devices and materials is a major challenge for the growth of Australia's technology sector. Particularly important among electronic devices are topological insulators, which are materials that are insulating in their interior but can support the flow of electricity on their surface. This project aims to develop new mathematical models for topological insulators. The project will also develop the application of powerful data analysis techniques to detect transitions between insulating and non-insulating phases. When fully operational, the data analysis approach can be applied to fully understand and explore a wide class of topological insulators. The project will build on Australia's outstanding international reputation in the mathematical sciences and provide a unique training ground for students and young researchers of relevance to emerging quantum technologies. In particular, the project outcomes have the potential to be of future national benefit to the development of new concepts for next-generation electronic devices and smart materials.												
DP240100929 Maier, Prof Dr Alexander G	**Targeting the host lipid environment to disrupt malaria transmission** This project aims to characterise host molecules (in particular lipids) that are crucial for the transition of malaria parasites from one host to another. Malaria parasites encounter different environments upon their transition from human to the mosquito host. This project expects to generate new knowledge on physiological changes that are triggered by particular differences in micronutrient abundance that allow the parasites to survive in the new host. Anticipated outcomes include the identification of new intervention strategies and improved transmission model systems for vector-borne diseases. This gained knowledge could provide benefits to future biomedical applications by informing diagnostics or treatment of lipid associated diseases. **National Interest Test Statement** Malaria has a global economic impact of over $17 billion per year. Australia is surrounded by countries where malaria is very common and poses major health, societal and economic challenges. In order to find new and more efficient cures for malaria, we need to know how malaria parasites take up the lipids from their human host that allow them to grow and survive. This project will identify lipids essential for the transition of the malaria parasite from the human to the mosquito host as well as how they function. We will uncover weaknesses in the parasite and provide specific mechanisms and molecules, which can be targeted by industry and NGOs to develop new malaria medications and intervention strategies. This new knowledge will also be relevant for preventing other mosquito-borne diseases and will lead to cheaper and more efficient ways to grow malaria parasites in laboratories. Combatting malaria will benefit Australia by economically and socially stabilising malaria-endemic countries in the Asia-Pacific, prevent disease in Australians abroad and halt a reintroduction of malaria to Australia.	103,759.00	218,143.00	228,568.00	114,184.00	0.00	0.00	664,654.00			Netherlands		
DP240101011 Lu, Prof Yuerui	**Harnessing Interlayer Biexcitons in Atomically Thin Heterostructures** This project aims to investigate the generation of high-quality quantum light sources by harnessing interlayer biexcitons in atomically thin heterostructures. This research expects to expand our understanding of fundamental physics of photon pair generation in atomically thin heterostructures. The	100,794.00	201,588.00	206,263.00	105,469.00	0.00	0.00	614,114.00			Singapore		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	expected outcome is demonstration of a prototype light-weight and intense quantum photon source based on novel materials, which can be readily integrated with photonic circuits for quantum communication technologies, enbling the developments of light weight portable devices, such as mobile phones, displays, and wearable photonics. This research could strengthen the development of new industries and lead to job creation in Australia. **National Interest Test Statement** Australia competes globally in a range of critical sectors for our economy, from smart sensing to quantum computation and communications. However, to ensure they remain competitive in future will require innovation in novel light-weight and high-performance quantum light sources, which Australia does not currently possess. This project addresses this problem: it will investigate the generation of high-quality quantum light sources by harnessing interlayer biexcitons in atomically thin heterostructures. The novel light-weight quantum photon sources are important for many quantum technologies and applications, such as quantum imaging, quantum communication and future quantum computation. These devices are expected to play an enabling role in the future developments of light weight portable devices, such as mobile phones, displays, distributed sensors, and wearable photonics. Through application in new devices, the outcome of this project will allow Australian manufacturers and designers to make and exploit novel materials, advanced light sources, and communication technology. This will help Australia lift productivity and economic growth in these sectors, maximising Australia's competitive advantage in smart sensing, information processing, computation and communications.												
DP240101061 McAllister, Prof Ian	**Government Popularity, Political Responsiveness and Democracy in Australia** This project aims to understand what affects government popularity and how this shapes the health of democracy. What citizens are concerned about and how their concerns are satisfactorily addressed is central to an effective democracy and to responsible government. The project expects to generate new knowledge about the operation of democracy by identifying the factors that shape government popularity and how and in what ways governments respond to them. Expected outcomes include a comprehensive understanding of how democracy in Australia functions, which should provide the benefit of insight into how Australian democracy might be reformed to better meet the expectations of the public at a time of declining public trust in politics. **National Interest Test Statement** The two-way flow of information between citizens and their government is central to a healthy democracy but has come under pressure in Australia in recent years. As democracy experiences stress around the world, understanding what most concerns citizens and how governments respond to those concerns is crucial to ensuring an effective democracy in our nation. By matching public opinion polls from the 1970s to the present with a wide range of social, economic, and political information, this project will identify how events, crises, and economic performance affect the popularity of governments, and, in turn, how they develop and implement policies in response. Through public presentations and accessible reports, this project will share with members of parliament and the general community, a series of actionable recommendations and strategies for democratic reform. It will help to influence and guide changes to the way Australia's political institutions work, supporting the development of a clear pathway for citizen dialogue, and improved flow of information between everyday citizens and their government. This will further strengthen the confidence of Australians in the capacity of our nation's democratic political system to respond to their concerns and ensure future government approaches better reflect the will of the people.	81,421.00	163,222.50	156,648.00	74,846.50	0.00	0.00	476,138.00			Germany, United States of America		
DP240101084 Licata, Prof Anthony M	**Stability conditions: their topology and applications** This project aims to answer questions about the topology of the space of stability conditions, which has emerged as a central object in a number of different mathematical areas in	70,343.00	140,686.00	139,367.50	69,024.50	0.00	0.00	419,421.00			United States of America, India, France, England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	the past two decades. The proposed work will have important consequences in representation theory, group theory, and algebraic geometry. The project shows that tools from previously unrelated areas, including discontinous differential equations and discrete dynamical systems, are crucial in the theory of stability conditions. Potential benefits include the resolution of outstanding conjectures in mathematics, the initiation of new connections between different areas of mathematics, and the introduction of machine learning techniques into mathematical research.												
	National Interest Test Statement												
	Humans have admired and studied symmetry for thousands of years, incorporating ideas of symmetry into art, music, philosophy, science, and especially mathematics. Historically, the mathematical study of symmetry has had a tremendous influence on many diverse kinds of human innovation, including physics, chemistry, engineering and materials science. With the rapid development of computer science, artificial intelligence, and machine learning, the mathematical study of symmetry promises to be an essential part of research in the twenty-first century. This project will use cutting-edge ideas from a wide variety of areas together in new ways, with the goal of deepening Australian expertise in this essential part of modern science. By bringing new tools into some of the deepest and most fundamental parts of modern mathematics, the project has the potential to strengthen Australia's position in machine learning, data science, and cybersecurity, in the interest of the safety and security of all Australians.												
DP240101102 Li, Dr Jinhu	**Counter-COVID public policies and the impacts on Australian children** This project aims to identify the causal effects of counter-COVID school closures, stay-at-home mandates and government support payments on the educational and developmental outcomes of Australian children. It will establish, for the first time, a comprehensive causal evidence base on the average and distributional impacts of these policies on children across the spectrum of schooling years from preschool to secondary school completion. This project expects to advance our understanding of child skill accumulation and the relative importance of schools, parents, peers and government intervention. Anticipated benefits include providing policy recommendations to restore student learning outcomes and reduce educational inequality in Australia.	113,609.00	190,415.50	159,488.00	82,681.50	0.00	0.00	546,194.00			Singapore		
	National Interest Test Statement												
	The Australian Government’s interventions during the pandemic, such as school closures and lockdowns, aimed to stop the spread of COVID-19. However, these interventions may have had unintended impacts on Australian children in terms of learning losses and widened the educational gap between children of different socio-economic backgrounds and geographical location. We know little about the causal impacts of these interventions and the extent to which the Government’s welfare support at the time lessened those impacts. We are also unclear about how best to now use Government support to address those impacts on children’s skill development. This project will identify the causal impacts of counter-COVID policies on the educational outcomes of Australian children and teens, including school closures, stay-at-home mandates and government welfare support. It will also investigate the ways in which these policies have shaped educational inequality. Through policy briefings, roundtables and forums we will share these findings with Australian government departments to help them translate the findings into policy interventions and targeted welfare support that restore student learning outcomes and reduce educational inequality. Those interventions and support will contribute to long-term benefits for Australian families with children who lived through COVID-19, especially those from disadvantaged backgrounds.												
DP240101274	**An ensemble approach to studying the ocean's role in climate change**	65,000.00	153,500.00	179,500.00	91,000.00	0.00	0.00	489,000.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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Constantinou, Dr Navid	Using a newly-developed ocean model that harnesses the power of graphical processing units (GPUs) instead of the common central processing units (CPUs) we can run global ocean simulations at 1/50th the cost. Utilising this speed up, we aim to pioneer a modelling framework to perform ensembles of eddy-resolving global ocean simulations under various climate-change scenarios. This ensemble approach will enable us to separate the changes we see in future projections that are due to climate change from the changes that occur in the due to the natural variations of the climate system. The project's outcomes will increase our confidence in future climate change projections, including ocean heat uptake, and sea level rise.												
	National Interest Test Statement												
	Performing suites of climate simulations under multiple climate change scenarios has historically been computationally prohibitive. This project leverages cutting-edge advancements in ocean modelling to build a new modelling framework that enables us to run these suites of simulations. This 'ensemble' of climate scenarios will allow for the separation of future climatic changes into those due to the natural variations of the climate and those due to human-induced climate change. The results of this project will put Australia at the forefront of climate research. The new computational techniques and the modelling framework will have broad use by researchers in the climate science community, which will then be passed on to stakeholders and commercial applications. By being able to distinguish between the climate change signal and the climate's natural variations, we will obtain more accurate estimates of future climate change, ocean heat uptake, and sea level rise. This research will have manifold benefits including better preparedness for future climate states, enabling future Australian climate adaptation and mitigation efforts. The research will thus enhance the resilience of our economy, society, and natural environment. The increased accuracy of climate projections enabled by this project, including increased accuracy of future sea level, will support insurance and financial risk projections and help guide government policy at national and local levels.												
DP240101346 Hodgman, Dr Sean S	**Quantum non-locality with mass-entangled metastable helium atoms atoms** The aim of this project is to use ultracold helium atoms to test aspects of quantum entanglement. The unique properties of metastable helium will provide significant new knowledge of this fundamental quantum property. Expected outcomes include measuring a Bell test between mass entangled atoms and testing the weak equivalence principle (the universality of free fall) using a quantum entangled state as the test masses. This should provide benefits including input into new theories that attempt to unify quantum mechanics with general relativity and will be relevant for emerging quantum technologies such as more powerful quantum computing or quantum simulation of complex systems.	105,480.00	182,234.00	155,103.00	78,349.00	0.00	0.00	521,166.00			United States of America		
	National Interest Test Statement												
	The emerging field of quantum technology is predicted to become a $4 billion industry in Australia and provider of 16,000 new jobs by 2040. Many of the benefits that Australia expects quantum technologies to offer us, such as secure data transmission or fast computing performance, stem from the little understood property termed quantum entanglement – the phenomenon where quantum particles can be linked such that changing one will instantly change the other, even if they are separated by a large distance. A foundational understanding of entanglement is crucial to the development of quantum devices. This proposal will use cutting edge methods in quantum technology to investigate little-known basic properties of entanglement and produce fundamental knowledge that will guide the Australian industry’s development of new quantum technologies, for example in the design of quantum computers. Such quantum computers will potentially benefit everyday Australians in a range of ways, from faster drug and vaccine development to more efficient stock market forecasting and faster transport networks.												
	Shedding Light on the Proton Radius Puzzle with												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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DP240101441 Truscott, Prof Andrew G	**Ultracold Helium** This project aims to shed light on an outstanding discrepancy in physics known as the proton radius puzzle, first seen in hydrogen but now being studied in helium. Capitalising on existing international collaboration between experiment and theory to exploit the advantages of ultracold helium, this project aims to determine the isotopic nuclear charge radius difference with unprecedented precision, using our state-of-the-art quantum electrodynamic theory. This will not only answer fundamental questions about helium atomic structure, but may also reveal new physics beyond the current Standard Model. The validation of atomic structure theory should provide benefits in applications including the realisation of more accurate atomic clocks.	78,522.00	153,776.00	151,953.00	76,699.00	0.00	0.00	460,950.00			Canada, China (excludes SARs and Taiwan)		
	National Interest Test Statement This project tackles a big question in the field of fundamental atomic physics: why is there a discrepancy in measurements of the size of the proton – a fundamental building block of matter? The answer to this question may signal new physics beyond the current theory known as the Standard Model of the universe. If this project is able to answer this question, it will place Australian research at the leading edge of modern physics. This project aims to address this question by harnessing a unique Australian facility that creates ultracold helium atoms and drawing on our international theory collaboration to make complementary nuclear size measurements in helium. As well as maintaining our world-leading expertise in this field, the answer to these types of fundamental questions will drive long-term technological advancement in Australia, benefiting the country's economy. All technical advancements that ultimately transform society are based on fundamental research. In particular, our results will improve our understanding of atomic structure theory that may lead to, for example, more accurate atomic clocks, without which everyday tools like navigation systems would not be possible. The prominence of this research would enable collaborations that may accelerate the development of quantum technologies such as precision sensors, which are underpinned by the precision atomic physics developed in this project.												
DP240101472 Grasha, Dr Kathryn A	**Exploiting James Webb Space Telescope Observations of the First Galaxies** This Discovery Project aims exploit the next generation spectroscopy with the James Webb Space Telescope, combined with Australian supercomputing expertise to make fundamental new measurements of the formation of stars in the first galaxies. The results will be used to make predictions for key experiments that will be conducted with the Square Kilometer Array. The research outcomes aim to benefit astronomy by generating new knowledge of high redshift galaxies and provide new spectral star-formation diagnostics which will be made available to the general astronomical community. The project also aims to provide cultural benefit through effective public and education as well training of future leaders for astronomy and industry research.	78,839.00	157,678.00	161,098.00	82,259.00	0.00	0.00	479,874.00			United States of America, Switzerland		
	National Interest Test Statement This project exploits next generation spectroscopy from the James Webb Space Telescope (JWST) and Australian supercomputing expertise to measure the formation of the first galaxies. This will enable predictions for Square Kilometre Array measurements of how stars transformed the Universe by heating cosmic gas. By utilising computer simulations to model the physics of the infant universe, this program will deliver unprecedented insights into how properties of stars transform galaxies over time, shedding light on one of the oldest and most basic questions asked by humanity since the beginning of time: "where did we come from?". The answers we obtain will be of broad interest to the public, and the process of obtaining them will equip fundamental research techniques that will prepare students for careers in a wide range of private- and public-sector professions that rely on technical skills where demand is												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	high, such as data science, financial modelling, and aerospace and defence applications. The project will also build on Australia's traditional strength in astronomical sciences, and help the country play a more prominent role in a number of major international scientific collaborations. This will ensure that Australia has world-leading technical expertise that is crucial for our future economic growth.												
DP240101494 Petersen, Prof Ian R	**Nonlinear Quantum Control Engineering** This project will develop tractable methods for the design of robust, nonlinear, coherent feedback control systems building on the approach of quantum risk sensitive control and extending classical nonlinear control methods. It will also develop methods to design robust and nonlinear filters and coherent observers for nonlinear and finite level quantum systems and apply these results to the design of robust measurement based quantum controllers. In addition, the project will apply coherent and measurement based robust control methods to achieve useful emergent behaviours in nonlinear quantum networks. Such emergent behaviours may involve the robust reduction of decoherence effects and the robust solution of quantum computational problems.	82,001.00	166,032.00	170,451.50	86,420.50	0.00	0.00	504,905.00			United States of America, Japan, Wales		
	National Interest Test Statement Quantum technologies have the potential to lead to a whole new technological infrastructure. However, quantum technology is now moving to a phase where its progress requires advances in engineering and in particular control engineering. Control Engineering is needed to ensure that quantum machines such as quantum computers and quantum sensor networks maintain high levels of performance, precision and accuracy in the presence of nonlinear and uncertain dynamics along with quantum and classical noise. This will be achieved by enabling the design of feedback controllers and filters which are either based on quantum measurements or coherent interactions. For example, in the area of quantum computing, quantum controllers can be used to reduce the level of noise in quantum computers leading to inaccurate quantum calculations. Also, in quantum communications, quantum control engineering can be used to design filters which correct errors in quantum channels. This project will help produce those advances. The research will advance Australia's capabilities in quantum control engineering, improving our ability to apply emerging quantum technologies in areas like manufacturing, medicine, environmental sensing, and defence. For example in the area of defence, advances in quantum sensor networks, which can detect signals at levels approaching the limits imposed by quantum mechanics, can help our defence forces to improve early warning systems.												
DP240101733 Mathesius, Prof Ulrike	**Improving grain legume seeds for future climates** Grain legumes are essential for sustainable agriculture and human dietary protein, but seed quality is predicted to decline under future scenarios of high CO2 and warmer temperatures. This project aims to improve legume seed quality under future climates by comparing metabolites and physiological traits of chickpea and other legumes to establish mechanisms by which legumes maximise seed nutrient allocation. The anticipated outcomes include new metabolite-based breeding markers for the improvement of crops with higher seed proteins, micronutrients and bioactive compounds that are adapted to future climates. Seed nutrient improvement will also include increased biological nitrogen fixation to reduce the need for chemical nitrogen fertilisers.	127,452.00	275,234.00	298,572.00	150,790.00	0.00	0.00	852,048.00					
	National Interest Test Statement It is predicted that crop quality will decline due to climate change through reduced nutritional value. This can be partially achieved through more intensive use of fertilisers. Nitrogen fertilisers can improve the quality of crops however, they can cause significant pollution in soil, air and water. Novel strategies to improve grain quality with minimal fertilisers are urgently required. This project aims to identify new ways of breeding grain legumes for future climate												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	conditions by revealing mechanisms and markers of grain nutritional quality under elevated carbon dioxide and temperatures. Focussing on chickpea, this project will improve beneficial interactions with soil bacteria that significantly reduce the need for nitrogen fertilisers by fixing atmospheric nitrogen gas into a form usable by plants. The outcomes of our research will be used by the Agriculture sector through improved seed quality in grain legumes that are adapted for future climate conditions, with additional health benefits of legume consumption in human and animal diets. We will connect with grain legume breeders to utilise our findings to accelerate breeding, allowing future generations of farmers to benefit from improved grain legume yield and quality while reducing production costs and environmental degradation.												
DP240101824 Connor, Dr Simon E	**Deep-time history of culturally significant lands and waters in Timor-Leste** This project aims to provide a new framework for understanding and managing lands and waters of exceptional biological and cultural value. The project expects to generate the first long-term records of ecological change in Timor-Leste's unique forest and tropical savanna ecosystems, providing novel insights into ancient cultural landscapes threatened by climate change. Expected outcomes include enhanced collaboration between Australia and Timor-Leste and comprehensive data and educational resources relevant to managing climate impacts on livelihoods. This should provide significant benefits to scientific dialogue in the Asia-Pacific region and help support economic opportunities that respect indigenous environmental knowledge.	59,820.50	153,214.50	155,819.50	62,425.50	0.00	0.00	431,280.00			Timor-Leste, England		
	National Interest Test Statement Climate change threatens local environments and agricultural practices that affect the livelihoods of millions of people in Australia and our surrounding regions. Identifying how environments have responded to change over time can inform the management of healthy ecosystems and food security. This project will bring together traditional knowledge and scientific practices to help local communities and governments in Timor-Leste understand how climate change has affected tropical ecosystems, water resources and agricultural production over thousands of years. It will show how people created productive and resilient landscapes in changing conditions. By working hand-in-hand with local communities, scientists and educators, the project will strengthen traditional knowledge to develop culturally appropriate ways of managing our region's unique natural resources into the future. Doing so will benefit Australia by making our region more resilient to climate change and strengthening our neighbouring relationships through mutual recognition of our area's rich cultural heritage.												
DP240102015 Ireland, Prof Michael J	**Cubesat Technologies for High Spatial Resolution Astrophysics** This project aims to combine cubesat and hybrid cubesat/micro-satellite concepts studied in Australia and Japan, prototyping and space-qualifying the most custom components, enabling a future affordable launch. High angular resolution is critical for studying processes of star formation, black holes, and exoplanets. An array of small satellites can greatly exceed the angular resolution of a single telescope, or the sensitivity of atmosphere-limited ground-based interferometers. Space qualifying the key inter-spacecraft metrology and fibre injection technologies will not only enable a future Australian satellite astrophysical interferometer, but is also relevant for optical communications links and earth observations.	95,128.00	173,876.00	159,086.00	80,338.00	0.00	0.00	508,428.00			Japan		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	Space technology, especially on small platforms such as cubesats and microsats, is undergoing a significant current expansion, driven by new technologies that can vastly decrease the cost of ambitious missions. This project will space qualify an ambitious new technology, placing Australia at the forefront of world research in precision satellite constellations for remote sensing. Remote high angular resolution sensing is needed not only for astronomy, but also for ground-based observations in agriculture, mining and defence. The space telescopes we are developing are already being used by the company High Earth Orbit (HEO) Robotics to image other satellites. The core technologies of injecting starlight into fibres is the same as needed for laser communications, where satellite to ground links could transfer precious imaging data from Australian satellites to end users rapidly. In addition to direct influences of this research, this project consists of several well-defined Science, Technology, Engineering and Mathematics (STEM) student-led Advanced Manufacturing subprojects that will train research students in building practical equipment for making measurements in a variety of industries.												
DP240102399 Tregoning, Prof Paul	**Tracking flood waters over Australia using space gravity data** This project aims to assess the utility of near-real-time data from the currently operating space gravity satellite mission to quantify and track flood waters in Australia. Through analysis of the satellite data and fusion of observed signals with rainfall, river flows and conventional hydrological modelling, it expects to create new knowledge of soil moisture and movement of flood waters. Expected outcomes include a capability to improve hydrological models by including the information of water signals obtained from the near-real-time observations. This should provide significant benefits such as more accurate land saturation maps and better predictions of runoff and flood risk.	81,705.00	169,701.50	173,540.00	85,543.50	0.00	0.00	510,490.00			United States of America		
	National Interest Test Statement Droughts and floods in Australia cause billions of dollars of economic loss. The intensity of both droughts and floods is increasing in a warming climate, making the management of water resources more and more critical. This project will contribute to addressing how water management affects Australia's economy by providing a means of tracking flood waters and environmental flows down Australia's rivers through novel uses of satellite data. Combined with rainfall data and modelling of the movement of water in the landscape, the research will make it easier to predict runoff and flood risk. The project will demonstrate the viability of monitoring river flows from space, providing a new means of preparing downstream communities for imminent floods as well as ensuring that sensitive ecosystems receive allocated environmental flows during dry periods. We will share our outcomes with all Australian community and businesses who depend on reliable water resources and warnings of potential flood events.												
DP240102450 Moresi, Prof Louis N	**How Large Earthquakes Change Our Dynamically Deforming Planet** The project aims to understand the multiscale dynamics of interacting faults on a global scale using novel computer simulations with unprecedented spatial and temporal resolution. The focus of the research is to investigate the two-way coupling that exists between cycles of great earthquakes on plate boundaries, the global stress field, deformation within the crust, and changes to the Earth's dynamic topography. This is an important, foundational question in the emerging field of decadal scale global geodynamics. The tools are intended to improve reference models used to study sea-level changes in response to global ice loss. They support better climate models and improved forward planning tools for at-risk coastal communities.	45,075.50	128,330.50	161,810.00	78,555.00	0.00	0.00	413,771.00			United States of America, China (excludes SARs and Taiwan)		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	This project examines very slow motions inside the Earth that cause stress to build-up in the crust and eventually result in catastrophic earthquakes. The internal flow is a result of the Earth slowly cooling but it also occurs in response to the melting of polar ice caps and there is a sudden change after every major earthquake which we do not yet fully understand. This project aims to deliver advanced computer models connecting the changing shape of the Earth to the recurring cycle of large earthquakes around the globe. The Australian continent is surrounded by ocean trenches where great earthquakes frequently occur and a better understanding of the surface response to global geological activity is important for creating better models of how groundwater flows beneath the land surface, determining the scale of sea-level changes along the Australian coastline, and estimating risk to low-lying coastal communities when sea-levels do change. Australian communities that do face significant geological risk can benefit from freely-available models and accessible tools to help inform local residents, businesses and their representatives about the nature of the hazards they may encounter.												
DP240102611 Fischer, A/Prof Tamas	**Nuclear RNA surveillance and its connection to splicing quality control** Due to the error-prone nature of RNA splicing, elaborate quality control processes ensure that only correctly spliced transcripts can leave the nucleus. It has long been known that incorrectly spliced mRNA transcripts are degraded by the nuclear RNA surveillance machinery, but how the RNA quality control machinery is connected to nuclear RNA surveillance is not known. This proposal aims to uncover the connection between these two important processes and will fill a significant gap in our understanding of how splicing quality control and nuclear RNA surveillance work. The project will also identify sequence features that trigger abortive splicing reactions and will thus help to improve the design of synthetic mRNAs.	84,404.00	171,558.00	169,308.00	82,154.00	0.00	0.00	507,424.00			Germany		
	National Interest Test Statement Advances in the biotechnology industry are changing the lives of every day Australians. Newly designed or altered genes can be introduced into various organisms, enabling improvement of a vast range of applications, including crop yield for food production and resistance of crops and livestock to meet current and emerging environmental challenges. When a synthetic gene is introduced into an organism, it is governed by the same rules governing the organism's own gene regulation processes. In the gene expression pathway, one critical step is to cut and paste together parts of the gene to form the final message that a protein is produced from – known as "splicing". Splicing is an error-prone process and therefore complex quality control mechanisms have evolved to ensure that only correct proteins are produced. The problem is that these mechanisms are not well understood. This project will provide better understanding of how splicing quality control works and will have wide-ranging impact in improving the design of synthetic genes. This project will directly benefit Australian agriculture, health and biotechnology industries, thus providing economic and environmental benefits to Australians. Our findings will be disseminated throughout our national network of academic and industry partners through the recently formed Shine-Dalgarno Centre for RNA Innovation, facilitating uptake of our work.												
DP240102982 Solomon, Prof Peter S	**Characterisation of a novel disease immunity pathway in plants** This project aims to understand the mechanisms by which the novel signalling molecule, CAPE1, contributes to plant immunity. Studies to date have confirmed that CAPE1 inhibits plant diseases but it is unknown how. This project aims to provide a seminal advance to the field by elucidating how the peptide is generated, how it is perceived by the plant and the processes by which peptide contributes to plant defence. The expected outcomes of this project will include a detailed characterisation of a novel plant defence pathway as well the education and training of next generation of plant scientists. Achieving these outcomes would provide the basis for new innovative disease management strategies through	97,904.00	197,136.00	199,859.00	100,627.00	0.00	0.00	595,526.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
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	the manipulation of this novel pathway. **National Interest Test Statement** Plant diseases reduce Australian grain production by up to 25% leading to in excess of $1 billion AUD in losses due to reduced export and trade. Managing plant diseases is challenging and requires new and innovative approaches to improve crop yields. Fungicides are becoming less effective at reducing disease, plants are becoming more vulnerable to infections, and climate change is increasing the distribution of pathogens across the country. This project directly addresses these threats and subsequent economic losses by investigating a novel plant genetic defence mechanism. Cutting-edge approaches in biochemistry and genetics will be employed to exploit this new resistance pathway to enhance the ability of plants to fight pathogens and disease. The knowledge generated from this project will underpin new and innovative approaches by the Australian agriculture-technology sector. This will lead to the next generation of crops with improved inherent disease resistance. These outcomes will ultimately offer Australia significantly increased economic benefit and food security through reduced crop yield losses resulting from innovative disease management solutions.												
	The Australian National University	2,712,863.50	5,610,827.00	5,617,696.00	2,818,346.00	130,815.50	32,202.00	16,922,750.00					
University of Canberra													
DP240102056 Clulow, Dr Simon	**Restoring amphibian populations in chytrid-impacted landscapes** This project aims to address an outstanding problem in wildlife disease ecology: how can we enable susceptible amphibians to persist in the face of the chytrid pathogen, which has devastated amphibian biodiversity? This project expects to generate new knowledge by experimentally trialling two highly promising interventions: immunising animals and creating disease refugia through simple habitat manipulations. Outcomes of this project include a framework for predicting how interventions might enable host-pathogen coexistence. This project should provide significant benefits including enhanced understanding of wildlife disease dynamics that will pave the way for interventions to restore amphibian biodiversity in chytrid-impacted landscapes.	149,652.50	281,249.50	212,662.50	173,054.00	91,988.50	0.00	908,607.00					
	National Interest Test Statement Since being introduced to Australia in the 1970s, the amphibian-killing chytrid pathogen has devastated Australia’s unique amphibian fauna. Chytrid is implicated in the extinction of four species and linked to ongoing population declines in about 20% of Australian frog species. The problem, in Australia and globally, is that there are currently no feasible interventions that are effective in reducing chytrid impacts in the wild, and thus slowing or reversing the ongoing loss of biodiversity. This project will experimentally trial two interventions with the potential to mitigate chytrid impacts in the wild and thus enable susceptible species to persist with the pathogen. This will benefit Australia by preventing the ongoing decline in biodiversity and enabling locally extinct species to be restored to chytrid impacted landscapes. We will work closely with conservation managers to ensure that the knowledge generated in this project is widely adopted to improve conservation outcomes.												
	University of Canberra	149,652.50	281,249.50	212,662.50	173,054.00	91,988.50	0.00	908,607.00					
	Australian Capital Territory	2,862,516.00	5,892,076.50	5,830,358.50	2,991,400.00	222,804.00	32,202.00	17,831,357.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
New South Wales													
Charles Sturt University													
DP240102614 Clarke, Prof Stephen P	**The Ethics of Voluntary Assisted Dying: Promoting Constructive Debate** This project aims to analyze core concepts that play key roles in emerging debates about the ethics of Voluntary Assisted Dying (VAD) in Australia. The project expects to make constructive contributions to these debates, promoting respectful dialogue and reducing polarization. Expected outcomes include a new model for managing VAD in Australia which is ethically appropriate and consistent with community values. This model will also benefit other countries where the ethics of VAD is under consideration. The project will promote the dignity and autonomy of all and ensure that issues about the conscientious refusal of healthcare professionals to participate in the provision of VAD are handled in an ethically appropriate and effective manner. **National Interest Test Statement** This project is about ethics of Voluntary Assisted Dying (VAD). Since 2017, all six Australian States have enacted legislation permitting VAD for patients who are terminally ill and expected to die within six months, or a year (depending on the state). VAD has previously been introduced in nine other countries and has become a source of ongoing controversy in all of them. Debates about VAD are polarised and in danger of becoming even more polarised, hindering constructive discussion about the future of VAD in Australia. In the project we analyse key philosophical and ethical arguments that underpin these debates including disputes about whether people who are choosing VAD are always choosing for their own reasons and are not coerced into accepting VAD, whether there can be 'death with dignity', and whether and when healthcare professionals should be allowed to refuse to provide VAD. The research will benefit Australia by promoting respectful dialogue and by making positive contributions to public debate about the ethics of VAD in Australia, helping to reduce the polarisation of that debate. Research outcomes will be promoted beyond academia by producing a briefing paper summarising our results, organizing a public-facing conference, writing popular articles, making media contributions in newspapers, radio and television, and by publicising findings on a dedicated project website.	65,153.50	188,673.00	211,416.00	87,896.50	0.00	0.00	553,139.00			Singapore, England		
	Charles Sturt University	65,153.50	188,673.00	211,416.00	87,896.50	0.00	0.00	553,139.00					
Macquarie University													
DP240100112 Neil, Prof Bronwen J	**Images of Power in the Roman Empire: Mass Media and the Cult of Emperors** Contemporary leaders understand the power of an image to influence public opinion, but are they following a path well-trodden by Roman emperors? This project aims to illuminate the role that mass media and images played in securing and sustaining imperial power during the Later Roman empire from the Flavians to the Theodosians (69-450 CE). The comparison of coins, statues and monuments will shed new light on the dynamic ways that popular media were used to mediate	35,919.00	84,467.50	79,265.00	30,716.50	0.00	0.00	230,368.00			Greece, Italy, Turkey, Sweden, England, Netherlands		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	between emperors, their officials, provincial elites and the wider populace, and show how leaders used mass media in the Roman world. Social and cultural benefits include a better understanding of the ways that leaders today handle such media to influence public opinion. **National Interest Test Statement** The relationship between images of power and public opinion is one that has vexed leaders from the ancient Roman emperors to politicians in the current day. The use of media as a tool for persuasion and the costs of such media, often borne by the public purse, have come under increasing public scrutiny. The difference between representations of politicians in Australian capital cities, especially Canberra, and regional areas has parallels in the Roman empire. This project will allow Australian leaders to understand better the influence of religious persuasions on its own democratic institutions, including the press. This improved understanding may bring significant cultural benefits by prompting a more careful handling of popular media and especially religious representations. Educating Australia's school-aged citizens in the pros and cons of manipulating the political process through mass media may have significant social benefits in the short term, by improving their understanding of our political process and civic responsibilities, and long term, as these students are Australia's future voters, tax-payers, and political agents. Academic benefits of the project will include a better understanding of the impact of media on governance in the ancient world, and the training of early career researchers in methods of historical research with significant social impacts.											
DP240100422 Crane, A/Prof Monique F	**Understanding Growth in Emotion Regulatory Flexibility in Emerging Adults** Emerging adults (ages 18-25) are now facing unparalleled social and technological change and the on-going effects of the COVID-19 pandemic. Such demands can be overwhelming and undermine engagement with education and employment, with serious impacts for the individual and society. At the same time, our novel model proposes that the diverse daily adult-like stressors that characterise emerging adulthood can also drive growth in flexible emotion regulation when combined with reflection on, and insight into, their own coping processes. Our research expands scientific knowledge by taking the first steps to uncover why some emerging adults increase their ability to flexibly regulate their emotions over this period, whereas others fail to do so. **National Interest Test Statement** Emerging adulthood (ages 18-25) is a unique time when young people are facing significant changes and stressors as they transition into adulthood. The COVID-19 pandemic and its on-going effects have only added to these demands. It is important for both individuals and society to understand the factors that affect the ability of young adults to grow capacities that will help them to manage these stressors. What if these diverse stressors could be harnessed to aid the growth of capacities for resilience, specifically emotion regulatory flexibility? We will discover how this transformation takes place, the time course for these changes, and why some young adults excel at it while others struggle. In doing so, we will empower young adults to turn these stressors into catalysts for refining their emotion regulatory flexibility, setting them on a path towards positive outcomes in adulthood. With Australia's future prosperity riding on the shoulders of its emerging adults, this research is more important than ever. During this key window, emerging adults who can enhance their flexibility in emotion regulation are in a better position to ensure positive trajectories of functioning. We will explore new frontiers in emotion regulation research, share our findings through workshops, online resources, and peer-reviewed papers, and empower the educators, organisations, and communities who shape the lives of young adults with the tools they need to guide them towards a brighter future.	56,339.50	135,617.50	140,485.50	61,207.50	0.00	0.00	393,650.00			Germany, United States of America, Israel		
DP240100795 Li, Dr Ming	**On the Hunt: Boosting Productivity of Cell Factories by Advanced Searches** This project aims to advance our fundamental understanding of molecular mechanisms underlying protein secretion in yeast, an industrial workhorse and a	83,501.50	176,958.00	193,848.00	100,391.50	0.00	0.00	554,699.00			United States of America, Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	model organism. It will develop a unique multifaceted research platform to identify and analyse superior yeast strains with the desired traits at the single-cell level. Expected outcomes include a new analytical tool for high-throughput strain analysis and advanced knowledge of yeast molecular biology that can be applied to improve cell factories for the next generation of fuels, food and pharmaceuticals. This will provide significant economic and social benefits by boosting biotech industry growth, facilitating the transition to a sustainable society and improving Australia's biosecurity. **National Interest Test Statement** The biological world can be harnessed to produce many useful products of industrial importance, including proteins secreted by yeast which have numerous beneficial applications in the production of food, fuel and pharmaceuticals. This emerging 'bioeconomy' calls for new yeast cell factories capable of secreting industrially important proteins in a cost-competitive manner. This project aims to address a key gap in our understanding of protein secretion in yeast, a key player in numerous large-scale industrial manufacturing processes, by deciphering its molecular basis, and ultimately ensure success and growth of the bioeconomy. The fundamental knowledge gained from this project will speed up the development of industrial microbes, allowing us to make food, fuel and pharmaceuticals cheaper and faster. This will not only increase the availability of these biotechnology products, but also drive down manufacturing costs, bring new jobs to Australia and stimulate the production of new value-added bioproducts. These developed yeast strains would be able to grow on renewable waste materials, which is eco-friendly and sustainable. This will benefit the Australian economy, support the emerging domestic biotech industry, improve environmental protection and promote sustainable development.												
DP240100914 Alfano, Prof Mark R	**Trust and Distrust in Social Epistemic Networks** This project aims to discover critically-needed understandings of the social causes and consequences of 'fake news'. It will do this by investigating and mapping the relationship between 'epistemic vices' and people's acceptance of misinformation and disinformation (e.g. conspiracy theories). It will bring together approaches from experimental philosophy, natural language processing, social network analysis, and normative reflection to provide new insights regarding distrust and intellectual vice, thus significantly advancing knowledge of the 'dark side' of social epistemology. Results will lead to urgently required guidance regarding the features of social networks that exacerbate or buffer against the manifestation of these vices. **National Interest Test Statement** Democracy is under threat in Australia and worldwide. One challenge democracies face is the spread of misinformation and unwarranted conspiracy theories by domestic and foreign actors, who undermine civic trust and interfere with efforts to address global problems like the coronavirus pandemic and climate change. If we lack a shared reality, we will not reach consensus on how to respond to these generation-defining challenges. To help shield Australian and global democracy, this project aims to deliver reproducible results and open-source tools to enable Australian individuals, organisations, and regulators to assess the capacity of a social network to produce and disseminate knowledge and understanding. The national benefit is the improvement of national resilience to attacks such as the spread of misinformation by those hostile to our shared national interest in a well-functioning, orderly democracy. The project intervenes both at the level of the individual (including their character traits such as closed-mindedness and attitudes such as distrust) and at the level of society (including geometries of trust and distrust).	103,524.50	209,785.00	135,482.00	29,221.50	0.00	0.00	478,013.00					
DP240101150	**Cosmic Renaissance: The Last Chance for Planet Formation Around Dying Stars**	80,000.00	152,500.00	152,500.00	80,000.00	0.00	0.00	465,000.00			Belgium, Italy		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Kamath, Dr Devika K	This project will generate a novel model where planets emerge from gas expelled during interactions between dying stars, rather than forming around young stars. It relies on unique multi-wavelength, high-angular resolution observations of planet-forming disks around dying stars and simulations of disk formation. This research will provide unprecedented insight into the uncertain process of planet formation around young stars and inform future space exploration missions. The project's benefits include generating new knowledge, enhancing Australia's reputation in stellar and planetary astrophysics, inspiring STEM interest, and training researchers in machine/deep learning and hydrodynamic modelling - valuable skills for academia and industry. **National Interest Test Statement** Astronomy attracts young and old by providing context for our lives and inspiring us to ask questions that transcend our relatively humdrum existence. The fascination that the field exerts on individuals is powerful: planets circling far away stars, with characteristics that are different from those on Earth, harbouring alien life, have been the subject of science fiction stories for hundreds of years. Our project aims to determine how planets form, not around Sun-like stars, but around old, dying stars. The story of these second-generation planets is intertwined with the life and death of stars, and how they interact to create disks and nebulae. This project fosters engagement with European Southern Observatory member countries and maximizes returns on investments in astronomy infrastructure. The resulting high-impact science will elevate Australia's global reputation.The cultural impact this carries has significant national benefit, inspiring students to appreciate how science can be applied to understanding the natural world. This project will also train researchers in the art of image reconstruction, modelling fluid motion, with applications in science and industry, including Defence, Aerospace, and Climate Science. The associated student training will foster programming proficiency, analytical skills, and big-data science - a sought-after skill set in industries that value innovation and information.												
DP240101654 Ittner, Prof Lars M	**Transcriptional and translational regulation of the neuronal protein tau** The microtubule-associated protein tau is important for brain development and performance. To perform these functions, tau levels and its variants are tightly controlled in brain cells. However, the factors that regulate tau remain largely unknown. This project will employ latest gene technologies to identify the molecular regulators of tau, for each step of the process from DNA to the protein. The outcome of this study will significantly advance our understanding of gene regulation and mechanisms for controlling protein levels and contribute to a deeper understanding of brain function during development and aging. **National Interest Test Statement** Aging in a productive way is of utmost importance to individual and population health. An essential component to this is maintaining brain function throughout life. This project will address a fundamental question – How is a factor that is critical for brain development and function controlled and regulated to execute its diverse functions? Building on our international leadership in genetically engineered mouse models to understand brain physiology, we will employ latest technologies to identify and validate master regulators of this brain factor, from the start of DNA up to protein formation and function. Furthermore, we will generate novel models where, for the first time, this regulation can be followed in the living organism. Both the experimental outcomes and the technologies developed during this Discovery Project will guide biomedical research in areas beyond the significant advances in knowledge regarding brain development and function. Providing a deeper understanding of brain function will eventually assist in life style advice and therapeutic developments that help increase social and economic contributions of ageing Australians. To this end, the Discovery Project will significantly advance current knowledge and further enhance the high international standing of Australian neuroscience	132,408.50	271,570.00	234,007.00	94,845.50	0.00	0.00	732,831.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	research.												
DP240101666 Lustri, Dr Christopher J	**Creating Hybrid Exponential Asymptotics for use with Computational Data** Asymptotic analysis is a vital tool for studying small influences with critical effects. This project aims to create an innovative fully-automated asymptotic framework for studying phenomena which are invisible to classical approximation methods, using new ideas from asymptotics and numerical complex analysis. The outcome will be the first framework that can be used on data from numerical simulations or real-life measurements, and which can be applied automatically without hands-on expert input. It will be used to design submerged structures and efficient vessels with minimal energy loss from surface waves. Expected benefits include making powerful methods accessible to scientists, and new paths for energy-efficient industrial design.	84,701.50	175,023.00	145,757.50	55,436.00	0.00	0.00	460,918.00			England		
	National Interest Test Statement Many physical systems, including water wave calculations, quantum interactions, and gravitational waves, are driven by important "hidden" behaviour, which currently requires sophisticated mathematical calculation to uncover. This project will create a new automated method for computing hidden behaviour which does not require mathematical expertise; it will be automatic and accessible to nonmathematicians, and designed to be used with real-life data. No such method currently exists. This will provide a new cheap, effective tool for scientists, engineers, and designers to make mathematical predictions without expensive lab experiments, providing direction for innovation and design. The economic and commercial benefits for Australia will arise due to having accessible tools available for using algorithmic methods in industrial design. An example of this benefit is that this project will boost Australia's maritime industry by letting Australian engineers design submerged structures and streamlined vessels with minimal detectable surface signature and wave drag. The translation of the benefits of this project to Australia will complement the an innovative engineering and design sector that is eager to use modern approaches such as machine learning and optimisation algorithms in their design processes. The outcomes of this project will be used in a pre-existing industrial partnership, which will enable the advantages of the tool to be quickly tested and applied to industry.												
DP240102143 Le Roux, A/Prof Johannes J	**A network perspective for ecosystem responses to plant invasion** Invasive species are key drivers of global change, yet, our understanding of their negative impacts on ecosystems is limited within many contexts. This project will provide the first large-scale test for interactions between plants and microbes, via network analyses, as yardsticks for invasive species impacts on ecosystems. Using innovative approaches that link interactions network properties with ecosystem functioning, the fundamental data generated in this study will answer unsolved theoretical questions, providing evidence for the use of networks to predict and mitigate invader impacts. These benefits are not only crucial for biodiversity managers but also for those responsible for sustainable crop development under future climates.	47,846.50	128,596.50	157,250.00	149,250.00	72,750.00	0.00	555,693.00			South Africa, Spain, Czech Republic		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	All organisms interact with other organisms. These ecological interactions shape biodiversity and its underlying functions. This project will characterise interactions between plants and soil microbes, via network analyses, to predict the risk and ecological damage caused by invasive plants to Australia's unique biodiversity. Invasive species have cost the Australian economy >$390 billion in the last 60 years, demonstrating the need for novel approaches to better understand, prevent, and manage them. The project's outcomes will benefit Australia's environment and economy by informing new ways to assess invader impacts and manage invaded lanscapes, resulting in better outcomes for biodiversity, national biosecurity, and risk assessment. Australia is home to more than 2,700 invasive plant species, many of which severely disrupt native communities. This project aims to 'rewire' essential interactions that are lost between native species under invasion to inform new ways for habitat remediation. More generally, there is an urgent need for innovation to reduce the impacts of ongoing global change on Australia's biodiversity and agricultural sector. Understanding perturbations caused by invasive species to plant-microbe interaction networks, and how to mitigate these impacts, will inform mananagment under diverse contexts for desirable outcomes, from assisting colonisation of endangered species to enhancing sustainable crop production under future climate conditions.												
	Macquarie University	624,241.00	1,334,517.50	1,238,595.00	601,068.50	72,750.00	0.00	3,871,172.00					
Southern Cross University													
DP240100968 Cutter-Mackenzie-Knowles, Prof Amy N	**Advancing Child and Youth-led Climate Change Education with Country** Climate change education is in its infancy. By co-researching with Indigenous and non-Indigenous children, youth, and Elders across Australia and Canada, this project conceptualises and advances climate change education with Country. Climate change education is not adequately understood within Western science. Western perspectives on climate crises are in deep contrast to Indigenous perspectives enmeshed in continuous storying with descendants, ancestors, and Country. Collaborating with Elders, this project will generate child and youth-led transcultural curriculum and pedagogical understandings of climate change education with Country. It delivers on the United Nations Convention on Climate Change through corresponding quality education.	113,972.00	206,029.00	176,885.50	84,828.50	0.00	0.00	581,715.00			Canada		
	National Interest Test Statement Australia is a signatory to the United Nations Framework Convention on Climate Change (UNFCC, 1992) with obligations to develop ensuing climate change education policy. However, there is currently no Australian government climate change education policy nor corresponding school-based curriculum and pedagogy. This is in a context where young people are increasingly exposed to apocalyptic visions and lived experiences of the disastrous impacts of climate change, causing existential anxiety. This project aims to empower children and youth (5-18 years) to generate new understandings of inherited Indigenous and Western climate change knowledge in advancing climate change education. Alongside academic and community impact outcomes, this significant knowledge will be translated into a co-designed child and youth-led climate change education policy statement and a corresponding curriculum and pedagogical framework for teaching and learning climate change with Country in primary and secondary schools. This important connection of Indigenous knowledges with Western sciences will enable the next generation of Australians to confidently adapt to the impacts of environmental change. This novel project delivers on Australia's UNFCC commitments and the 2030 United Nations Agenda for Sustainable Development by engaging with Indigenous and non-Indigenous children, youth, and Elders through building transcultural knowledge and capacity for quality education in climate change with Country.												
DP240101163 Swann, A/Prof Christian	**Open(ing up) goals in physical activity: What works, when, and for whom?** This project aims to advance knowledge of open goals as a new goal-setting approach to optimise the adoption and maintenance of physical activity among insufficiently active individuals. This project expects to generate substantive insights into the mechanisms that explain why, when, and for whom open goals are particularly	78,340.00	146,677.00	140,943.50	72,606.50	0.00	0.00	438,567.00			England, Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	beneficial in this population. Expected outcomes include a theory of open goals that will inform physical activity promotion efforts, with the potential for broad population-level dissemination and scale-up. Significant benefits include the ability to set physical activity goals that are enjoyable and intrinsically motivating to pursue, while also avoiding detrimental effects of current practice (eg high failure rates). **National Interest Test Statement** We know that insufficient physical activity leads to chronic illness, low productivity, and social isolation. Currently, 75% of Australian adults are insufficiently physically active, causing thousands of deaths and an economic burden of $13.8 billion per year. Goal-setting is one of the most commonly used strategies to increase physical activity. This project addresses a key research gap in that current goal-setting practice leads to stress, perceptions of failure, and high dropout rates. This project will establish open goals as a new approach that better meets the needs of insufficiently active individuals. This research will develop a theory explaining why, when, and for whom open goals are most beneficial, as well as the long-term outcomes associated with the implementation of open goals. The knowledge developed in this project will be directly relevant to the 12.6 million Australian adults who are insufficiently active, and is expected to lead to significant health and economic benefits for the nation. The research outcomes will be immediately translated into practice via existing partners that are ready to adopt open goals. A publicly available mobile-app will provide goal-setting resources to help Australians become more active, and a website will provide resources to help fitness and health professionals and organisations adopt open goals. These resources will be shared with national and international partners to accelerate use of open goals on a large scale.												
	Southern Cross University	192,312.00	352,706.00	317,829.00	157,435.00	0.00	0.00	1,020,282.00					
The University of New South Wales													
DP240100128 McNally, Prof Gavan P	**Risky choices: From cells and circuits to computations and behaviour** This project aims to ask and answer fundamental questions about how we safely make risky decisions to guide our behaviour. It combines theoretically driven approaches from experimental psychology with state-of-the-art technology for mapping and manipulating brain function. The project expects to show, with unprecedented behavioural, brain cell type, and circuit precision, how we safely make choices, how these choices are shaped by experience, and how controlling these cells and circuits controls choice. This outcome should provide significant benefits including a new knowledge base bridging behavioural, cognitive, and neural sciences to advance theories of behaviour and laying a new basic science platform to understand impulsive behaviours. **National Interest Test Statement** This project applies state-of-the-art, integrative capabilities to show how we safely make risky decisions. This is a core capacity allowing us to safely navigate the world and to make safe but timely choices in dangerous situations. Disruptions in this core cognitive capacity can drive impulsive, risky behaviours such as reckless driving, drug taking, unsafe sexual behaviour, and aggression as well as underpin the even more problematic behaviours seen in problem gambling, substance abuse, and related disorders, problems directly affecting 1 in 3 Australians and costing the Australian economy more than $80 billion a year. By decoding the brain cellular and circuit mechanisms for risky decision making and showing how experience shapes these mechanisms, this project will inform and advance brain stimulation, brain-machine interfaces, and cognitive training efforts to improve decision-making. In the longer term, the integrative capabilities we develop to control these brain circuits will assist in predicting, identifying, and reducing disruptions in these core cognitive capacities, thereby helping deliver important social and economic benefits to the Australian community.	100,145.00	203,385.00	215,542.00	112,302.00	0.00	0.00	631,374.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240100186 Trudgian, A/Prof Timothy S	**Class numbers and discriminants: algebraic and analytic number theory meet** This project aims to investigate connections between analytic and algebraic number theory utilising the theoretical and computational expertise of the research group in number theory at UNSW Canberra. The potential findings are highly significant since the innovative generation of new fundamental knowledge will expand the field, and have cryptographic applications. The expected outcomes include increased capacity in fundamental science and greater understanding of classical and quantum cryptographic protocols. This project will provide the additional, and substantial, benefit of generating research output, training HDR students, and contributions towards national security.	86,793.00	176,067.00	149,802.00	60,528.00	0.00	0.00	473,190.00			United States of America, Canada, England		
	National Interest Test Statement This project explores the distribution of prime numbers, the structure of lattices, factorisation, and other objects in mathematics related to cryptography. Given the recent rapid advance in computing power, there is a substantial knowledge gap between theory and potential computational output. Put another way, problems in cryptography which were 'shelved' in the past as being computationally infeasible can now be tackled. It is absolutely essential to address the fundamental research underpinning these problems, and then to pursue cryptographic applications. This proposal addresses the fundamental science behind problems in cryptography. Expected outcomes include a better understanding of correspondence between mathematical theory and cryptography. This may lead to enhanced cryptographic and security protocols when put into practice. The benefit to Australia is two-fold: first, expanding knowledge and building capacity in research output and training of HDR students, and second, in obtaining more secure cryptographic systems to underpin the security of Australia in an increasingly digital world.												
DP240100238 Seidel, Prof Jan	**Engineered topological nanostructures – a new frontier in materials design** The aim of engineering and utilising topological defects such as domain walls and and skyrmions in functional materials is currently receiving tremendous attention. Their significance lies in a plethora of fascinating phenomena for fundamental research and future technological applications in nanoelectronics. One frontier area of research is negative capacitance nanoelectronics using such materials, carrying the prospect of revolutionizing ultralow energy electronics, which will be developed here. The project's expected outcomes are new concepts for the synthesis and design of topological nanostructures for such applications. The utilization of these materials will benefit efficient controllable functionality for future nanoelectronics.	99,174.00	200,848.00	200,848.00	99,174.00	0.00	0.00	600,044.00			Luxembourg		
	National Interest Test Statement Topological materials are an emerging class of high-efficiency functional materials for nanoelectronics applications in environmentally friendly and energy-efficient information processing, and sensor and detector applications, for example in novel miniaturized wifi and mobile phone antenna designs. This proposal will significantly impact the development of novel synthesis and application concepts based on topological nanostructures in such materials, which allows control of the materials properties through a new concept. A better understanding of such control will pave the way to novel multifunctional materials, including their use in ultralow-energy												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	electronics designs using environmentally friendly architectures. We will seek partnership opportunities with existing Australian manufacturing and defence industries through established and new collaborations, facilitating Australia's position in these critical global sectors. Therefore, this project will enable the development of advanced materials engineering capabilities in Australia, and it will foster the design, manufacturing and commercial exploitation of these new materials. This will place Australia at the forefront of this critical area for future technology demand.												
DP240100294 Tian, A/Prof Fangbao	**Scaling laws for aerodynamics of moving wings in the Martian atmosphere** This project aims to increase understanding of the aerodynamics of bio-inspired flight in the low-density atmosphere of Mars. The significance of flight in planetary exploration is shown by the ongoing success of the Ingenuity helicopter on Mars, and the Dragonfly rotorcraft planned for use on Titan. Expected outcomes of this project will be innovative numerical modelling techniques validated using local specially designed low-pressure experimental facilities. Benefits will be more accurate design guidance for efficient and robust flapping and rotary wing robotic vehicles for Mars and other space exploration that take advantage of the unique atmospheric conditions, and in placing Australia at the forefront of such design technology.	71,939.00	145,622.00	150,698.50	77,015.50	0.00	0.00	445,275.00			Japan, United States of America		
	National Interest Test Statement This project aims to determine the aerodynamics of unmanned drones in Martian environments and to develop scaling laws to bridge our knowledge gap between Earth-designed and Mars-capable flight platforms. The intended research outcomes will benefit Australia scientifically, technologically and economically. Scientifically, this project will enable modelling of wings and propellers operated in complex and challenging non-Earth environments and generate numerical and experimental data for building scaling laws for achieving efficient flight, laying the foundation for significantly advancing Australia's contribution to planetary exploration. Technologically, this project puts Australia at the forefront of space exploration by providing fundamental and technological contributions to the design of efficient unmanned flying probes with greater payload capability and higher efficiency. These contributions will benefit Australia since novel designs of air vehicles based on fundamental and comprehensive understanding of aerodynamic principles that work on different atmospheric conditions as experienced on Earth and Mars could lead to breakthroughs in uncharted flight conditions and expand the utility and operating environments of drones for planetary exploration. Economically, the research capability developed has the potential to increase the global competitiveness of Australian industries involved in space exploration and unmanned aerial and surface vehicles technologies.												
DP240100300 Bao, Prof Jie	**Big Data-based Distributed Control using a Behavioural Systems Framework** With Industry 4.0 turning into reality, industrial processes are becoming distributed cyber-physical systems which generate, process, store and communicate large amounts of data. Using the behavioural systems framework, this project aims to develop a novel distributed control approach for complex processes directly based on big process data. A new model-free framework will be developed to represent and analyse the process/controller networks and interaction effects, and determine the feasibility of desired control performance under distributed control. Novel big data-based distributed control design approaches will be developed by extending the dissipativity, contraction and differential dissipativity conditions for behavioural systems.	69,589.00	141,528.00	146,224.50	74,285.50	0.00	0.00	431,627.00			Canada, Hong Kong (SAR of China)		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement Australia has very strong process/manufacturing industries representing over $156bn turnover and $46bn value added per annum. In these industries, many modern plants are of large scales, consisting of dozens process units interconnected with material recycle loops and energy integration. These processes have very complex dynamics but are often controlled by simple logic controllers that deliver inadequate performance. Meanwhile, a huge amount of high-dimensional process data is being collected during process operations. This project aims to develop a novel distributed big data-based process control approach to operate these complex processes and improve their energy and material efficiencies. The outcomes can also be applied to data-based distributed decision making (e.g., operations of supply chains). This project is expected to help the Australian process industries improve their competitiveness in the global market while reducing their environmental footprints. Distributed data-based process control is becoming a cornerstone of future manufacturing with Industry 4.0 turning into reality. This research project will enhance Australia's scientific reputation in the international arena. This project falls in Australian Government's National Science and Research Priority goal of "Advanced manufacturing: cross-cutting technologies that will de-risk, scale up, and add value to Australian manufactured products".												
DP240100378 Arns, Prof Christoph H	**Physico-chemical effects on long-time fluid transport for CO2 geostorage** This project aims to develop an efficient multi-scale laboratory-based modelling framework for the analysis of nonequilibrium transport and reaction processes occurring in CO2 storage scenarios. In a significant technological advance two non-destructive analysis techniques, Xray computed tomography and nuclear magnetic resonance, are combined with pore-scale simulations to address uncertainties in dynamic wettability alteration occurring during gravity driven convection. Expected outcomes are the in-situ characterisation of solid-surface interactions and predictions of multi-phase fluid flow. The project benefits the Australian resources sector by improving injectivity, storage efficiency and security of supercritical CO2 storage projects.	99,079.00	192,825.50	187,660.00	93,913.50	0.00	0.00	573,478.00			Germany		
	National Interest Test Statement The geological storage of carbon dioxide (CO2) is a key strategy of the Intergovernmental Panel on Climate Change (IPCC) to net zero global emissions. It is expected to be a multi trillion-dollar industry by 2050. The accurate prediction of CO2 plume migration and long-term storage capacity is limited by a lack of understanding of underlying mechanisms and interactions during carbon storage in porous rock, especially rock wettability and mineral reactions. This project addresses this knowledge gap by combining advanced X-ray tomography and magnetic resonance imaging techniques to characterise the microscopic changes of rock caused by CO2 injection. The research will enable Australian operators and regulators to benefit from resultant improved designs of CO2 injection scenarios and more accurate predictions of CO2 plume movement within a storage complex. This may enable Australia to set more ambitious emissions reductions targets and offer Australia competitive advantage in a decarbonising economy.												
DP240100462 Baker, A/Prof Matthew A	**Rerunning the evolution of an ancient bacterial propeller** This project aims to measure how the propeller which drives bacterial swimming originated and then evolved. This project expects to generate new knowledge in molecular evolution using interdisciplinary techniques in synthetic biology and biophysics to resurrect ancient proteins and test how they can be directed to evolve in a contemporary host. Expected outcomes include the development of new types of flagellar motor for applied uses in synbio and microfluidics, and new methods to resurrect ancient proteins and evolve their function for purpose. This should provide significant benefits by	102,870.50	207,491.00	205,741.00	101,120.50	0.00	0.00	617,223.00			New Zealand, Japan, Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	delivering a de novo molecular motor for custom applications and galvanise public interest in how this iconic molecular complex originated and evolved. **National Interest Test Statement** This project uses synthetic biology to learn from evolutionary history to engineer new molecular motors that can be used for propulsion. We use statistical methods to best estimate proteins that may have existed millions of years ago and then resurrect them and test them in the present day. By doing this, we learn much about protein adaptation during historical environmental changes, as well as learning how to engineer novel microswimmers that are powered by different energy sources and swim in different ways. This research contributes to significant national infrastructure and investment in Synthetic Biology, estimated by Prime Minister and Cabinet (in Nov 2021) to contribute $70B/yr to Australia's economy by 2050. This project builds future capacity, including in industry, for the engineering of new molecular motors and the generation of new methods for mining insight from ancient events and extinct organisms. The bacterial flagellar motor is of widespread public interest - it plays a key role in helping us understand the origins of complexity in biology. In this project we satisfy this public interest by demonstrating exactly how it arose, and how we can make it anew.												
DP240100566 Gribben, Prof Paul E	**Do root microbiomes control seagrass response to environmental stress?** The project aims to determine the role root microbes play in controlling seagrass responses to environmental stress. By integrating marine and microbial ecology, environmental genomics and ecosystem function (e.g., biogeochemical cycling), this project is significant as it will create new knowledge of the processes that confer seagrass resilience to global environmental issues. An expected outcome is an increased understanding of how microbes control seagrass health and an enhanced capacity to develop effective restoration strategies for Australia's valuable seagrass ecosystems. Benefits include improving the extensive environmental, economic, social/cultural services Australian communities derive from seagrass ecosystems. **National Interest Test Statement** Australia's coastal communities depend on healthy seagrasses to support food security and reduce the impacts of climate change through shoreline protection and carbon storage. Currently valued at AUD$5.3 billion annually, seagrasses are experiencing global losses due to multiple environmental stressors such as climate change and pollution, with current conservation efforts often having limited positive outcomes. Efforts to conserve and restore seagrasses have focused on improving water quality, ignoring the critical role below-ground processes under microbial control contribute to seagrass health. We lack knowledge of the timing, location and mechanistic role of microbes in the formation and development of seagrass communities. Using novel experiments methods, this project will provide new information on the role of root microbes in controlling coastal seagrass species' response to environmental stressors. In providing a new understanding of how root-microbes influence seagrass health, the results will also provide evidenced-based support for coastal managers and policy makers. In particular, strategies leading to enhanced resilience of existing seagrass meadows and improved restoration outcomes when intervention is required. This project supports the Australian Governments national scientific priority in 'Environmental Health'.	108,803.50	225,304.50	163,260.50	46,759.50	0.00	0.00	544,128.00					
DP240100769 Kuo, Prof Frances Y	**High Dimensional Approximation, Learning, and Uncertainty** This project aims to develop next-generation computational methods for complex problems in science and engineering that have many uncertain parameters, using advanced high-dimensional strategies and deep learning to enhance computational speed. The significance of the project is that these methods will help address important applications that at present are not	100,559.00	192,333.00	185,895.00	94,121.00	0.00	0.00	572,908.00			Austria, Belgium, England, Finland, Germany, Switzerland, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	feasible or at the edge of feasibility. The expected outcomes are powerful methods that will be mathematically rigorous and suitable for a wide variety of applications. The benefits are that the project will boost Australia's position as a leader in innovation, and contribute to future developments over a wide area, from aerospace engineering to personalised computational oncology. **National Interest Test Statement** This project has potential benefit to Australian applied science and industry, especially in advanced manufacturing and finance, and wherever the need is to quantify uncertainty. For example, in the manufacture of an aircraft component it is essential, for reasons of both safety and cost, to understand the air-flow consequences of the inevitable random manufacturing imperfections. This needs, in other words, quantification of uncertainty, which is a principal theme of this project. Other potential applications are in finance, where Australia is a world leader, and where the management of uncertainty is of paramount importance. More generally, the advances in computational technology could help boost Australia's position as a world leader in innovation.												
DP240100770 Gu, A/Prof Zi (Sophia)	**Orientated biointerfacing of cell-mimetic nanoparticles** The project aims to create next-generation cell-mimetic nanotechnology by providing in-depth understandings and precise control over cell membrane coating orientation of biomimetic nanoparticles. Our approach is to design and develop new synthetic and analytic strategies to construct and quantify orientated biointerfacing. This will generate new knowledge and patentable methodologies related to orientated biomimetic nanoparticles. Expected outcomes include significant contributions to Australia's scholarly outputs, enhanced national capacity in disruptive nanotechnology, new opportunities for national value-add material manufacturing, and long-term benefits to biomedical and veterinary industries through new materials and nanotechnologies. **National Interest Test Statement** Innovative value-added materials play an important role in efficient manufacturing and higher quality products. Australia has significant expertise in value-added materials, including nanomaterials. Nanotechnology of materials provides new opportunities for value-added material industries. However, the application of traditional synthetic nanoparticles is significantly restricted because of harmful immune responses, inherent toxicity, and suboptimal delivery performance. This project aims to develop next-generation biomimetic nanoparticles that have optimised cell-mimetic surface composition and offer many advantages over traditional nanoparticles in interaction with biological systems. New knowledge and technology created will enable high-performance biomimetic products to be produced locally, thus strengthening Australia's competitive capacity in the value-added material market and supporting the longer term growth of Australian manufacturing of high-value products across veterinary, cosmetic, food, and pharmaceutical industries through employment and export opportunities.	90,424.00	186,148.00	194,344.50	98,620.50	0.00	0.00	569,537.00			United States of America		
DP240101019 Ng, A/Prof Derrick Wing Kwan	**Integrated Sensing and Communication for 6G Wireless Networks** The project aims to investigate the open challenging research problems for realising high-speed sixth-generation wireless networks with seamless networked sensing capabilities via integrated sensing and communication (ISAC). The significance of this project is	85,459.00	173,068.00	177,764.50	90,155.50	0.00	0.00	526,447.00			Germany, Israel, Canada, France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	expected to generate new knowledge of ISAC exploiting advanced communication theory, signal processing theory and optimisation theory. Expected outcomes of this project include pragmatic robust beamforming, joint channel and sensing parameters estimation, resource allocation designs and a system-level analysis as the foundations and tools to unleash the full potential of ISAC. These should provide significant economic benefits to wireless service providers and mobile users worldwide.												
	National Interest Test Statement												
	The telecommunications industry in Australia has contributed more than 20 billion AUD annually to the country's GDP. The rise of the Metaverse and the digital twin has led to the emergence of new applications such as extended reality, holographic communications, smart e-health, smart cities, and autonomous driving, which demand enhanced wireless communication and sensing capabilities. However, state-of-the-art fifth-generation (5G) communication systems do not support these requirements. Therefore, it is crucial to explore the integrated sensing and communication (ISAC) paradigm for the upcoming sixth-generation (6G) communication. This paradigm can provide a highly flexible and cost-effective deployment of high-speed and versatile communication infrastructure to promote the development of a sustainable digital society and is essential for ongoing productivity growth in Australia. The results of this project will offer a new system paradigm to facilitate the adoption of 6G communication networks in the next decade, providing Australian companies in all sectors with the opportunity to capitalize on new technology. Additionally, the high-quality research conducted by this project will enable Australia to maintain its global competitive edge in research and drive the country's future prosperity in terms of its economy.												
DP240101062 Culcer, A/Prof Dimitrie M	**Topological semiconductors resonate with an elusive form of radiation** The aims of the project are to fill a substantial knowledge gap in a class of novel semiconductors that can function as sensors in a frequency range where conventional semiconductors do not work. The way these materials interact with light is not fully understood. The project expects to provide this understanding of great significance and generate new knowledge in physics and materials science. Expected outcomes include a results database that will guide experiments and enable future sensor design. The project expects to provide substantial benefits by identifying the best materials for use as sensors in this frequency range, which has applications in communications, defence, and in the Science and Research Priorities of Food and Transport.	80,139.00	156,978.00	153,524.50	76,685.50	0.00	0.00	467,327.00			United States of America		
	National Interest Test Statement												
	This project focuses on a class of new semiconductors that can be used in sensing technologies. Reliable sensors work in specific frequency ranges and require the right materials in order to function properly. Conventional semiconductors perform well for most frequencies, but there is one range, the terahertz range, in which they do not work. In order to fill this gap scientists have turned to a family of newly discovered semiconductors which respond strongly to light, and could work in the terahertz range. However, the properties of these novel semiconductors are not well understood, and this precludes the development of terahertz sensor applications, which would have uses across a broad spectrum of industries: food, aviation, communications and defence. The project aims to fill this knowledge gap by using advanced theoretical and computational modelling techniques in order to understand the properties of these new semiconductors and identify the best semiconductors for use as sensors in the terahertz range. Sensing is key to our government’s Science and Research Priorities of Food and Transport, enhancing food production and facilitating transport. The market for devices in this range is set to grow at 30% a year over the next 5 years, and reach $3.5bn by 2026. In the long run the research will enable sensors to be produced locally, supporting the longer term growth of the sensing and imaging industry in Australia through employment and export opportunities.												
	Designing metallic glass structures for damage												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101127 Kruzic, Prof Jamie J	**tolerance via 3D printing** This project aims to make breakthrough developments in understanding the processing-structure-property relationships that govern the fracture toughness of bulk metallic glasses produced by laser powder bed fusion additive manufacturing. The project intends to generate new knowledge on how to control fracture toughness of bulk metallic glasses via novel processing approaches that create designed glassy microstructures. Expected outcomes will be an enhanced capacity to develop and commercialise bulk metallic glasses with mechanical properties superior to conventional metal alloys. Anticipated benefits will be improved products for the aerospace, defence, transportation, biomedical device, consumer product, and 3D printing industries.	122,542.00	238,722.00	197,025.00	80,845.00	0.00	0.00	639,134.00			Germany, Austria, United States of America, Switzerland, China (excludes SARs and Taiwan)		
	National Interest Test Statement The Australian manufacturing industry produces roughly A$115 billion annually, and this proposed project will develop the capability to manufacture 3D printed metallic components with superior and more reliable performance. This proposed project perfectly aligns with the Practical Research Challenge “Specialised, high value-add areas such as high-performance materials, composites, alloys and polymers” under the Australian Government identified Science and Research Priority of “Advanced Manufacturing.” Within the advanced manufacturing sector, this proposed project specifically advances the field of additive manufacturing (3D printing), which the Australian Advanced Manufacturing Growth Centre identifies as a strategic R&D priority in its sector competitiveness plan. The availability of 3D printed metallic components with superior and more reliable properties is expected to provide economic benefits to the aerospace, defence, transportation, biomedical device, and consumer products industries, among others. Australian citizens are expected to benefit from the outcomes of this project through job creation in the advanced additive manufacturing sector and through the availability of products with improved performance, energy efficiency, and reliability.												
DP240101310 Ramer, Prof Rodica	**New Generation of High-Performance Radio Frequency Devices** The strong demand for faster internet speed pushes high-speed technology to evolve faster. Designing and developing devices are now facing changes that are far more complex. We aim to tackle them, proposing to develop phase-change materials-based electronic systems. The outcomes will be reconfigurable devices with unprecedentedly increased operational frequency, reduced critical system-level metrics, and elimination of control circuits. The successful results will address the Science and Research Priority of Modern Manufacturing and bring substantial socio-economic benefits to Australia by executing advancements of new technologies for modern wireless communications, leading to new high-tech opportunities, jobs, and economic growth.	98,091.50	198,920.00	202,048.50	101,220.00	0.00	0.00	600,280.00			Canada, France		
	National Interest Test Statement The mobile broadband sector provides billions of dollars to the Australian economy annually, with Australian society increasingly relying on superfast internet connectivity. The modern manufacturing industry continually challenges the core of new technologies, hence the need to develop progressively smaller, more reliable components for electronic devices. This project outcome will offer new techniques to create unprecedented performant innovative electronics and materials relying on more enabling, simplified circuitries for high-speed systems and transmission minimised-sizes communication infrastructures of future next decade commercial communications and the defence sector. The project will enable the immediate transfer and expansion of advanced onshore capacities in the design, manufacture, and commercial utilisation, placing Australia at the forefront												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	of this critical area of future technical demand and preparing Australian companies to seize the technology opportunity for business. The high-quality research conducted by this project will increase the global competitive edge of Australian-based research.												
DP240101365 Sharma, Prof Ashish	**Rare Event Simulation: Protecting vital infrastructure from flood extremes** This research aims to develop Rare Event Simulation to quantify the future risk of very rare to extreme floods. Expected outcomes include a framework for the design and maintenance of critical Civil Engineering infrastructure such as dams, extrapolation of extreme storm events beyond the observed record, and an assessment of change in rare flood risk across Australia. The significance of this world-first research lies in adapting rare event simulation techniques that have only been applied to computer system failure before, to water engineering design. With Australian riverine flooding projected to cause $170 billion in losses by 2050, the benefit of this proposal in reducing future infrastructure damage costs and liability is overwhelming.	61,500.00	147,065.00	138,130.00	52,565.00	0.00	0.00	399,260.00			United States of America		
	National Interest Test Statement Flooding is our most pervasive and costliest natural disaster, with over $1 trillion in damages since 1980 globally. With higher temperatures, these damages are expected to increase, with flood risk expected to triple, possibly as soon as the middle of this century. While this implies a $170 billion value loss in property by 2050 due to flooding across Australia, this figure pales in comparison to the total liability of our infrastructure that is ageing ($37 trillion just in dam infrastructure, a number that increases by roughly $25 billion each year). Evidence suggests that rising air temperatures are impacting the hydrological cycle, with the rare to extreme floods used to design critical infrastructure expected to increase. This study seeks to unravel the factors that result in such extreme flood events (orders of magnitude rarer than events we have observations for), providing the means to simulate change in the risk of failure of existing and planned critical infrastructure, providing a platform to ensure future generations remain safe and our most expensive infrastructural assets perform without failure.												
DP240101469 Waite, Prof David	**Improving Resilience of MCDI for Water Supply in Remote Communities** The AIM of this project is the development of robust, PV-powered water treatment units based on the emerging technology of Membrane Capacitive Deionisation (MCDI). The development of a more resilient approach to provision of potable water is particularly SIGNIFICANT to remote indigenous communities in central Australia where brackish groundwaters are unsuitable for use without prior treatment. EXPECTED OUTCOMES include development of resilient MCDI units incorporating innovative control of the charging and discharging cycles using "smart" (machine learning enabled) Digital Twins of these units. These MCDI units will BENEFIT any community requiring removal of contaminants from brackish waters without the need for external mains power supply.	67,664.50	131,924.50	129,876.50	65,616.50	0.00	0.00	395,082.00					
	National Interest Test Statement Although it is recognised that all Australians should have access to clean drinking water, this has not always been the case, particularly for remote indigenous communities in central Australia. Existing technologies such as												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	reverse osmosis and electrodialysis are not well suited to use in remote locations in view of their high energy use and the need for ongoing maintenance and/or frequent membrane replacement. The over-arching goal of this project is the development of robust, low energy (PV-powered) water treatment systems that unlocks the potential of the emerging technology of Membrane Capacitive Deionisation (MCDI) by using intelligent power conversion techniques which eliminate need for regular maintenance thereby enabling application for a large number of remote locations. This will be achieved by development of units that exhibit minimal fouling on long term operation through use of our novel power converters coupled remotely to machine-learning enabled Digital Twins. Aside from the obvious social and environmental benefits (i.e., access to water, low and/or renewable energy use), this project will deliver economic gains through the commercial exploitation of unit development and advancement of Australia's capacity for development and commercialisation of water treatment solutions. We will engage with State and Territory water agencies and relevant industry partners to translate this research to practice and enhance the use of this technology across Australia.												
DP240101471 Song, Prof Chongmin	**Computational MultiPhysics Analysis of 3D Structural Damage and Failure** This project aims to develop advanced modelling techniques to assess quantitatively, the impacts of environmental changes caused by climate on structures. New and existing structures need to be climate-resilient to sustain more frequent and hazardous climatic actions. Attention will focus on modelling structural damage caused by extreme loads and MultiPhysics mechanisms caused by climate change. The expected outcome is a new computational tool that will benefit Australian society by facilitating more reliable assessments of risks associated with structural damage and failure. This is significant in the design of structures where effective measures to improve functionality can be implemented to add value to an asset's life-cycle management.	81,924.00	168,698.00	182,217.50	95,443.50	0.00	0.00	528,283.00					
	National Interest Test Statement Australia's safety, well-being, and economic growth hinge on functional infrastructure. Climate change has resulted in an increasingly harsh environment, bringing about uncertainties that demand infrastructure to operate in more hazardous conditions. Australian citizens and the Government invest heavily in structures and infrastructure. In a resource-limited world, it is vital to prioritize climate resilience in their design, planning and maintenance to ensure worthwhile investments. Current engineering techniques have limitations in assessing the effects of environmental variations on structures exposed to a changing climate. This research aims to develop advanced engineering tools that will deliver the much-needed capability to analyse structural damage and failure due to environmental changes and identify possible mitigation strategies. The research outcomes will be shared with Australian industry end-users e.g. structural engineers via seminars, publications and user-friendly tools for adoption in diagnosing and preventing structural damage and failure. These will empower Australian engineers to provide cost-effective designs and solutions that improve the climate-resiliency and sustainable management of new and existing infrastructure, resonating with the Government's National Climate Resilience and Adaptation Strategy in the Built Domain. This has direct economic benefits to Australian asset owners and safety implications to the public accessing these infrastructures.												
DP240101480 Chen, Dr Feng	**Inference for Hawkes processes with challenging data** The Hawkes processes are statistical models for the analysis of high-impact event sequences, such as bushfires, earthquakes, infectious diseases, and cyber attacks. When the times and/or marks are missing for some events or when the data is otherwise incomplete, it is challenging to fit these models and perform diagnostic checks on the fitted models. This project aims to develop novel statistical methods to fit these models in the presence of incomplete data and to check the goodness-of-fit of the fitted models. The expected outcomes include publications documenting these methods and software packages implementing them. The primary	86,924.00	176,198.00	144,802.00	55,528.00	0.00	0.00	463,452.00			Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	benefits include the advancement of statistical methodology and the training of junior research personnel. **National Interest Test Statement** Bushfires have a constant presence in the Australian landscape, and they can have devastating impacts on the environment, wildlife, and human communities. A report by the World Wide Fund for Nature - Australia estimates that the 2019-2020 bushfires alone have cost Australian agriculture between $4 billion and $5 billion. Bushfires in Australia are expected to increase in frequency and intensity in response to climate change, and recent history seems to suggest that this is already happening. This project will develop and apply modern data science techniques to answer questions concerning the recent history and future trends of bushfires - how have bushfires been changing, in frequency and intensity? Will the recent trend in frequency and intensity persist into the future? These important questions involve analysing challenging data types such as incompletely recorded event sequences with imprecise event times. An important component of this project will be developing and evaluating new methodologies required to answer these core research questions. This research can potentially benefit the many Australian communities in bushfire-prone areas by providing the data intelligence needed for sound emergency response planning. To help realise such benefit, we plan to develop software that implements the proposed analysis methodologies and release it as open-source packages and free online applications to facilitate use by peer researchers and the general public.												
DP240101768 Cox, Dr Charles D	**Novel mechano-signalling pathways at sites of cellular adhesion** Piezo channels are membrane proteins that detect mechanical cues and underlie our sense of touch. We aim to characterize the first protein regulator of Piezo channels by developing and utilizing novel technologies including acoustic forces to monitor Piezo channel function. The significance of this study is underscored by the wide spread expression of Piezo channels and their involvement in many cellular processes. Expected outcomes are novel technologies to study mechanobiology, patentable peptide-based Piezo modulators and a new conceptual paradigm for understanding cellular mechanosensing. This knowledge will benefit a broad scientific community through technological advancements and pharmacological agents to manipulate Piezo channels. **National Interest Test Statement** Touch is possibly the most overlooked sense. We all receive tactile information about the world around us, every second of every day. But how do our cells know they are being pushed, pulled or squeezed? The major focus of this application are the molecules that enable our cells to decode these mechanical cues that act as ‘nature’s nanoscale strain gauges’. The project will establish new quantitative systems including novel acoustics to measure the function of these molecules providing new tools for unraveling the mechanisms of how tensile/compressive forces affect all cells. While the focus is the mechanical environment of the human heart the benefits and new knowledge generated will influence and inform fields well beyond cardiac biology into neuroscience (i.e. touch) and even plant biology (these molecules underlie the response of root tips to soil stiffness) with an understanding of these nanoscale strain gauges also being useful for the development of piezoelectric biomaterials in sustainable engineering. The project will also leverage the exciting discovery of novel protein-based regulators of these molecules. As a result, there are commercial and patent outcomes that will economically benefit Australia based on these novel regulators and their future therapeutic potential.	95,299.00	199,948.00	203,264.50	98,615.50	0.00	0.00	597,127.00					
DP240101775 Kirby, A/Prof Emma	**Understanding the implications of pandemic delays for the end of life** The untold toll of Covid-19 is emerging in ‘avoidable deaths’ linked to late(r) diagnosis or treatment due to pandemic-related delay. How delays are experienced and felt across families and communities requires urgent attention. This project aims to understand the implications of pandemic delay for dying and	44,952.50	106,317.00	126,588.00	65,223.50	0.00	0.00	343,081.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	bereavement, including the sociocultural factors that shape experiences of illness and care amid delay. The significance of this project lies in its innovative sociological approach; expected outcomes include the generation of new knowledge on needs at the end of life that move across contexts and settings. Benefits include provision of findings that will inform social and health policy and practice improvements to enable good deaths. **National Interest Test Statement** This project aims to understand the implications of pandemic delays at/for the end of life. Epidemiological modelling internationally has predicted waves of such delay-related deaths, and consequent priorities for health systems and public health, but the human side of pandemic delays are experienced and felt across families and communities – requires urgent consideration. As people affected by pandemic delays begin to near the end of life, there will be new and profound challenges for families, communities, health and social services. This project will provide significant social and policy benefits, delivering practice-relevant data to enable improved recognition and support for experiences of dying-in-delay by addressing critical research, policy, and practice gaps. The knowledge produced is expected to be of considerable benefit to Australia in documenting this unique socio-political landscape of illness and care, in managing current, and preparing for future crises. This research will also be of benefit across government and support sectors, advancing knowledge on how best to support new approaches to supporting dying and bereavement. Expected outcomes include the development of an evidence base with tangible policy and practice benefits that will enable more fulfilling and equitable end-of-life experiences. Outcomes will be translated via a suite of public-facing communication strategies including development of recommendations for policy and practice.												
DP240101865 O'Carroll, Prof Denis M	**Impact of redox condition on emerging contaminants fate** This project aims to improve our ability to predict the environmental drivers that control the fate of contaminants of emerging concern in the subsurface. Emerging contaminants are a concern due to their potential negative ecosystem and health outcomes. Prediction of their environmental fate will be of benefit as it will help ensure the safety of our drinking water sources and ensure that water sources are fit for purpose. With increasing pressure on our precious water resources prediction of the risks to this resource is essential. Expected outcomes are of significance as they will include a much improved ability to predict and control the ultimate fate of emerging contaminants in our water sources. **National Interest Test Statement** Contaminants of emerging concern (e.g., PFAS, bisphenol-A) have negative impacts to human and ecosystem health (e.g., carcinogens) as well as potential to develop antimicrobial resistance. There is a limited understanding of how they travel and react in our surface and groundwaters. This project will improve our understanding of the mechanisms that control contaminants of emerging concern in our waters, including the development of a predictive model. The inadequate understanding of where contaminants of emerging concern go and react in the environmental has stymied planning and implementation of a number of high-profile public infrastructure projects, including the Toowoomba QLD water reuse scheme as well as the Westgate Tunnel. These delays and public uncertainty can result in a loss of $100s of millions in taxpayer money. This project will help to limit the negative impacts of contaminants of emerging concern by improving our understanding of contaminants of emerging concern fate. The project team has the expertise to conduct their crucial work and an extensive network to work to disseminate outcomes to the public, academic community and regulators.	72,941.50	145,043.00	127,345.00	55,243.50	0.00	0.00	400,573.00			Canada		
DP240101934 Taji, Dr Behrouz	**Deformation of singularities through Hodge theory and derived categories** Moduli theory, the modern classification theory of	53,135.00	144,882.50	178,495.50	86,748.00	0.00	0.00	463,261.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	mathematical objects, is a branch of algebraic geometry with applications in wide-ranging areas from the theoretical high-energy physics (dark matter and Higgs boson) to data encryption and correction via cryptography. The aim of this project is to resolve central open problems in this theory. This will be achieved by developing new methods and establishing deeper connections between various dynamic branches of these fields. By undertaking research at the forefronts of these highly active areas, this project will both strengthen the current expertise within the Australian mathematical community and precipitate the advance of Australian high-tech industries. **National Interest Test Statement** The project is on a fundamental area of modern mathematics that underpins many technological advances in computing and cryptography. It builds the mathematical foundations for advances in mathematical physics, in particular the expanding fields of Mirror Symmetry and String Theory. In the short term, the project boosts Australian research capacity in a core part of 21st century mathematics. In the long term, the project trains a next generation of postdoctoral researchers, and provides new mathematical tools for researchers across mathematics and physics. Investment in this project keeps Australia at the forefront of these fields, and trains researchers who can support high technology applications.												
DP240101993 Wang, Prof Chun H	**Orthogonal Sensing Strategies for Soft Sensors to Discern Multiple Stimuli** The project seeks to create new orthogonal sensing technologies that enable a single soft sensor to detect multiple mechanical and thermal stimuli, overcoming the challenge of cross-talk between stimuli. The project expects to generate new knowledge of orthogonal sensing mechanisms and the effects of microstructure designs. The expected outcomes include novel soft sensors capable of accurately detecting pressure, stretch, shear, and temperature simultaneously. The new technologies are expected to support Australian companies in developing, producing and exporting sensors for soft robots and wearable devices for health monitoring, an area recognized as a key priority by the Federal Government's Industry Growth Centres. **National Interest Test Statement** The Australian government's health industry growth centre, MTPConnect, has identified wearable devices and digital health monitoring as two priority areas. The global market for wearable sensors in medical applications and robotics is projected to grow at an annual rate of 10% and reach USD 6.1 billion in 2026. However, there is a need for flexible and sensitive multimodal sensors that do not suffer cross-talk and can replace current rigid and bulky sensing systems. This project aims to develop novel orthogonal sensing strategies to enable soft sensors to detect multiple stimuli. These designs will enable the creation of soft, skin-like multi-modal sensors that can measure pressure, stretch, shear force, and temperature simultaneously. These sensors will have potential applications in healthcare, as well as in manufacturing, agriculture, and mining robotics. The project's success will position the Australian industry as a global leader in the advanced manufacturing of connected health sensors, thanks to the recently established ARC Research Hub for Connected Sensors for Health.	92,424.00	187,698.00	194,144.50	98,870.50	0.00	0.00	573,137.00					
DP240102082 Dobos, Dr Ned	**Moral Injury and the Ethics of Military Conditioning** Military personnel undergo extensive conditioning in the name of combat effectiveness and resilience. The aim of	36,985.00	63,393.00	113,168.50	86,760.50	0.00	0.00	300,307.00			United States of America, England,		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	this project is to determine whether any of the intended effects of this conditioning constitute "moral injuries", and to describe the ethical and policy implications if so. This will deepen our understanding of the ethics of military recruitment, training, and socialisation. The expected outcomes include a statement of the obligations owed to professional soldiers on account of the potential for moral injury in preparing them for deployment. This will enhance Australia's reputation for being ethically proactive and for taking a holistic approach to the welfare of its military servicemen and women.										Colombia, Zambia, South Africa		
	National Interest Test Statement The project is about "moral injury" in the military, defined as the corrosion of moral fiber, the deterioration of moral virtue, or the disruption of one's moral decision-making framework. The existing literature focuses primarily on combat-related moral injury, caused by wartime experiences such as repeated exposure to lethal violence. This project, by contrast, focuses on the potential for moral injury in the course of military training and conditioning prior to deployment. The project will strengthen Australia's reputation for the ethical treatment of its armed forces personnel, which is crucial if the Australian Defence Force is to continue recruiting and retaining suitably qualified members. The research outcomes will be promoted through a workshop for Defence stakeholders, and a report providing advice to the Australian government on how to navigate the ethical dilemmas created by the potential for moral injury in the profession of arms.												
DP240102533 Berry, Dr Scott D	**Regulating the composition of biomolecular condensates in living cells** Biomolecular condensation is a novel organising principle of living cells, driven by 'unmixing' of the cellular contents into compartments. It is observed from plants to animals and is involved in diverse processes from how cells repair DNA to how they perceive signals. This project aims to reveal how human cells control the composition of condensates, which is critical for their function. It expects to uncover new regulatory principles of cellular organisation by combining methods from quantitative cell biology and statistical physics. Expected benefits include building Australia's capability in the potentially transformational field of biomolecular condensates, which has diverse future biotechnology applications in health and agriculture.	103,014.00	187,907.50	175,811.00	90,917.50	0.00	0.00	557,650.00			Germany, Switzerland		
	National Interest Test Statement A newly discovered kind of liquid droplet that exists in living cells has been shown to control a variety of processes in biology from how plants adjust flowering-time according to environmental conditions, to how animal cells respond to signals from their surroundings. Changes in these droplets in human cells can also help to explain several neurodegenerative diseases, which affect 2% of Australians. This project will uncover the rules that cells use to control which of the cellular contents form droplets. This is a crucial step towards the long-term goal of manipulating them in biotechnology applications and will feed into Australia's Advanced Manufacturing endeavours. Future applications may include novel approaches to control plant environmental responses, which will support the adaptation of Australia's $28B crop industry to a changing climate; or novel therapeutics for neurodegeneration, which will improve the health and quality of life of Australians and reduce the economic burden of the health system.												
DP240102559 Gao, Prof Wei	**Experiment-numerical-virtual Generative Design for Nondeterministic Impacts** This project will establish an advanced nondeterministic	82,674.00	168,948.00	177,094.50	90,820.50	0.00	0.00	519,537.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	design methodology to uncover the optimised material properties and 3D printed metastructural capacity in real-time against impact loading. It will develop a rigorous framework that integrates numerical simulation, experiment, and machine learning-based virtual modelling to tackle practical challenges in design and manufacture of impact-proof materials and structures with intrinsic uncertainties. The generative design-calibration system unifying experimental-numerical-virtual processes will largely reduce the need for repetitive large-scale experimental tests. This project benefits civil, aerospace, automotive, and defence with competitive advantage through technological innovation. **National Interest Test Statement** Australia has an increasing risk of civil structures/infrastructures and vehicles subjected to impact loadings due to various intentional and accidental attacks. The Australian government costing on patching structures after crash damage has increased by $10 billion in the past 20 years. Continuous fibre reinforced composites, auxetic meta-structures and 3D printing are booming the design and manufacturing of advanced protective composite materials and structures, but the uncertainties caused by the complex geometries and current additive manufacturing techniques have not been well addressed. The integrated experimental-numerical-virtual generative design platform from this project will efficiently tackle the dynamic impact problems for 3D printed materials and structures with various inherent uncertainty properties, for which the current state-of-the-art methods are not able to solve. This project will resolve a critical current bottleneck in realising advanced protective structures and promote the applications of advanced composite materials crossing a wide range of industry sectors to ensure the structural safety and robustness. The new technologies from this research are significant for Australian economy bounded to civil, aerospace, defence, automotive, sport and biomedical industries. This project will provide an excellent training opportunity for early career researchers and research students with the high-level skills and in-depth knowledge in a priority discipline.											
DP240102605 Le Pelley, Prof Mike	**Towards a cognitive process model of how attention and choice interact** Before making any decision, we must gather information on what options are available. This process may influence the choices we make: if we do not notice an option, we will not choose it even if it would have been valuable. This project aims to examine how prior experience can produce attentional biases that influence decisions, and will develop a new computational model of this interaction of attention and choice as an outcome. This new knowledge will enhance the world-class status of Australian cognitive psychology. Moreover, it should provide significant benefits through improving our ability to predict and shape behaviour, and shedding light on the role of biases in healthy cognition and in the context of compulsive behaviours. **National Interest Test Statement** Our lives are a stream of decisions, from the mundane (what to have for lunch) to the momentous (which job offer to take). Because of their ubiquity, we often take it for granted that we understand how decisions are made. In fact, we know very little about how our prior experience influences the gathering and processing of information, and how this in turn shapes our decisions. We will address this gap by characterising how and when prior experience biases our attention and whether this leads to good or bad choices. By understanding these factors - and developing a computational model of how they operate - we can then understand, predict, shape and change behaviour. In addition to enhancing Australia's status as a leader in cognitive science research, this new knowledge will open the door to practical benefits. For example it could help policy-makers and marketers in designing effective communications that take advantage of attentional biases and drive positive behaviour change. The knowledge will also assist in devising effective training in high-pressure vigilance situations such as for the defence force, and contribute to refining interventions for alleviating compulsive behaviour such as addiction, obesity and gambling.	84,684.00	172,698.00	181,454.50	93,440.50	0.00	0.00	532,277.00					

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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DP240102648 Hossein Rashidi, A/Prof Taha	**Integrating land use, market equilibrium, and transport for city planning** This project is significant because it offers a comprehensive travel demand modelling platform that provides realistic, robust, and self-consistent metrics for transport infrastructure planning addressing contemporary changes in the transport system. The expected outcomes of the platform are incorporating recent advances in activity-based methods for travel demand modelling, developing a dynamic and integrated system for modelling short- and long-term household decisions, and creating a systematic calibration mechanism to handle the large-scale model. The benefits of this platform to the Australian transport industry and authorities will be demonstrated in use cases to design and optimise pricing for a multiplayer transport network.	91,650.00	168,050.00	154,221.00	77,821.00	0.00	0.00	491,742.00			Canada, United States of America		
	National Interest Test Statement Transport infrastructure is crucial to liveability. One approach for appraising potential investments in transport infrastructure is to analyse the investment costs and benefits by using a holistic system of models and to quantify the likelihood that perceived benefits (of investing) can be realised. Current appraisal approaches in Australia are limited for not accounting for contemporary challenges such as the advent of autonomous vehicles or the increasing use of electric vehicles. The proposed system of models accounts for such complexities in public transport, walkability, and road systems and incorporates preferences, diversity, and dynamics of choices of transport users to design efficient, sustainable, smart and user-friendly cities. Aspects like carbon taxing and fuel excise alternative schemes are quantified to guide urban planners and transport authorities in Australia in making evidence-based decisions on infrastructure proposals. As this project's open-source system of models gets developed, they can be adopted or integrated into existing models by transport agencies throughout Australia.												
DP240102658 Ferrari, Prof Belinda C	**Defining the biological boundaries to sustain extant life on Mars** Key challenges for life are access to water & energy, and in cold, arid environments trace gas chemotrophy is used by soil microbiomes to sustain life. Given the cold, hyper-arid conditions on the Martian surface are analogues to ice-free regions of Antarctica, atmospheric chemoautotrophic ecosystems are the most promising ecological model for Martian life in the present or recent past. This project is significant, as it aims to define the limits to energy, water and carbon production via trace gas chemotrophy. We will integrate biology with astrophysics to identify at which point life ceases. Expected outcomes include new knowledge on the biological envelope, with benefits to include the identification of Martian regions for exploration.	113,734.50	215,193.50	209,875.00	108,416.00	0.00	0.00	647,219.00			United States of America, South Africa		
	National Interest Test Statement What is life and how do we search for it? In this project we will determine the environmental threshold at which life, in this case bacteria dominating extreme Antarctic deserts, are metabolically active. This project will deliver new knowledge on the limits for life on Earth, based on the ability for bacteria to literally live on thin air. This project will put Australia at the forefront of Antarctic and planetary science, strengthening linkages with NASA and key international stakeholders interested in the search for life on other planets. We will promote findings through videos and workshops for the general public and diverse stakeholders, particularly through outreach channels												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	at NASA and the Australian Antarctic Program. Expected outcomes include new knowledge on the fundamental requirements for life and how to detect it on Mars. Benefits include the potential for Australia to lead the science underpinning the identification of Martian regions for exploration, including the translation of our findings to the design of instrumentation required to detect, or rule out, life.												
DP240102772 Boecking, A/Prof Till	**Viral capsids as high-efficiency nanoreactors** This project aims to develop state-of-the-art single-molecule imaging to visualise DNA synthesis inside authentic retroviral capsids in real time. The project expects to generate new knowledge in the fields of virology, synthetic biology, and nanotechnology by utilising cutting-edge fluorescent labelling reagents and microscopy technology. Expected outcomes include a comprehensive description of retrovirus reverse transcription, development of innovative biophysical techniques for the study of viruses, and an understanding of the engineering principles at play in natural nano-reactors. This project anticipates contributing advanced capabilities in bionanotechnology, benefiting therapeutic, biotechnology and synthetic biology applications. **National Interest Test Statement** When a retrovirus infects a cell, it converts its RNA into DNA. This is a complicated reaction involving many components. To keep all the components together, while preventing the host cell from interfering, retroviruses have evolved a capsid – a nano-sized vessel within which this reaction occurs. Importantly, once the conversion to DNA is finished, the capsid must release it for the virus to complete infection. How the capsid performs its many functions is poorly understood. The aim of our project is to reveal, at the molecular level, how the capsid uses pores to import the building block for DNA synthesis. We will also investigate the interplay between DNA synthesis and the stability of the capsid. Understanding these processes requires cutting-edge imaging technology and gives us a ‘blueprint’ for developing new and efficient nano-sized reaction compartments from minimal components. This advance in knowledge has potential applications for Australia’s nanotechnology industry for engineering catalysts with higher efficiencies. It will also give us unprecedented insight into a group of viruses that cause significant disease in humans and livestock, relevant to the Australian health sector and primary industries. We will communicate our findings widely to scientists and engineers via open access peer-reviewed publications and conference proceeding, and to the general public via the university’s social media platforms.	110,356.50	207,289.50	198,716.00	101,783.00	0.00	0.00	618,145.00			United States of America, England		
DP240103024 Goldys, Prof Ewa M	**On-site environmental DNA sensing with user-friendly test strips** Organisms shed their genes into the environment. This project aims to develop world-first field-portable biosensors for this environmental DNA. Based on a novel sensing principle, they will offer performance comparable with current laboratory-based techniques. They will be rapid (< 1 h), cost -effective (< $ 1 per strip) and robust. Project outcomes will include tube-based tests able to detect 1 DNA copy / microlitre and ultralight paper test strips, both with naked-eye readout. Applications of these sensors in water testing will be developed with an Australian industry partner Biopoint. Benefits will include strengthened protection against invasive pests and the spread of antimicrobial resistance without lab testing and sample logistics. **National Interest Test Statement**	94,433.00	196,654.00	207,110.00	104,889.00	0.00	0.00	603,086.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	The project will develop new biosensing methodologies for field-deployable monitoring of DNA molecules in the environment (e-DNA). The outcomes will be the design of new sensors and test strips, and their validation for the detection of aquatic pests and antimicrobial resistance genes in environmental water. Such test strips would be transformative for the food industry, agriculture, and environmental management where they will help to monitor early incursions of invasive species, as well as the impact of climate change on the Australian ecology. The ability to monitor e-DNA with such test strips addresses an unmet need across a range of areas such as environmental management, biosecurity, disaster response and public health. Future commercial benefits for Australia will be realised through: (i) technology licensing to existing and new industrial partners; (ii) through the provision of expert advice to validate, scale up and de-risk the project technology; (iii) and through potential future startups. Specific advances will be made in the areas of gene-based detection, an area where Australia could carve a niche in high value-add sensor manufacturing. With the global market for biosensors projected to be worth over US$200 billion by 2026, this is a key area of investment for Australia to support local advanced manufacturing industries in a national priority area.												
DP240103034 Morris, Dr Richard G	**The geometry of genome access: lessons from HIV** Access to the cell’s nucleus, and hence its genome, is of deep scientific and commercial significance. It is controlled by a phase-separated diffusion barrier within the nuclear pore complex. Recent evidence, however, has shown that HIV can cross this barrier with its protective capsid intact, despite it being over one thousand times larger than the limit for passive transport. Combining concepts from soft-matter physics with recombinant assays, this project aims to uncover the link between the unique geometry of HIV capsids and their ability to subvert the nucleus’ defenses. The expected outcome is a step-change in the understanding of nuclear access control, with downstream benefits to virology, bio-engineering and bio-technology.	79,899.50	230,946.00	232,455.50	81,409.00	0.00	0.00	624,710.00			England		
	National Interest Test Statement The proposed research aims to understand the biophysics that underpins how HIV can subvert the defences of the nuclear gatekeeping complex in order to access the cell’s genome. It contributes to Australia’s national interest in several areas. The knowledge gain has the potential to lay the groundwork for advances in the biotechnology, health and biosecurity sectors, particularly in areas relevant to genetic engineering and viral infection (both human and agriculture). It also has the potential to enhance Australia’s international reputation as a global leader in biophysics and biomolecular research, and as a world-class education provider. To do this, the proposal leverages existing cutting-edge infrastructure available in Australia, both at UNSW and the Australian Nuclear Science and Technology Organisation (ANSTO). As a result, researchers and students associated with this project will develop their scientific knowledge; critical thinking; and transferable skills in a way which will benefit Australia and an innovation-based economy. By providing integrated training in experimental biology and physics, we prepare Australia’s scientists of the future with skills fit for application to bioengineering and biotechnology.												
DP240103130 Wong, A/Prof Yvonne Y	**Counting neutrinos to per-mill accuracy** This Project aims to supply the most precise to-date calculation of a critical parameter in cosmology, the effective number of neutrinos, in the context of the standard model of particle physics. Crucial to the correct interpretation of cosmological observations, this parameter enables the reconstruction of the universe's timeline from which to infer its properties. The expected outcome is a number of 4-digit significance that can be used in all future cosmological computations/analyses. Besides raising Australia's international profile in basic science research, this project expects to provide significant societal benefits via the training of HDRs in advanced mathematical modelling and computing, transferable skills across many sectors.	85,000.00	175,000.00	165,000.00	75,000.00	0.00	0.00	500,000.00			Belgium, Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement What is in our Universe? For millienia mankind has sought to answer this question. This Project addresses a part of this question by supplying a theoretical calculation of the Universe's radiation density according to known particle physics. This calculation is important, because knowing how much radiation there is allows us to deduce from observations how much of the Universe's content is in the other forms of energies, e.g., dark matter, dark energy. Also, should observations reveal more radiation than is predicted by standard physics, it would also serve as indirect evidence for physics beyond the standard model. This Project is at the forefront of international physical science. Its successful completion will contribute to expanding Australia's knowledge base and research capability at the interface of particle physics and cosmology, enhancing the coherence of the national research programme in the fundamental physical sciences, and hence strengthening Australia's scientific competitiveness on the world stage. Beyond fundamental research, significant societal and economical benefits can be expected to derive from the training of HDRs our research programme provides in high-level problem solving, advanced mathematical modelling, and numerical programming, etc., high-demand transferable STEM skills ever more important in Australia's knowledge-based economy across many sectors. Public science education provided by our outreach activities will generate cultural benefits.												
DP240103194 Xue, Prof Jingling	**Ownership-based Alias Analysis for Securing Unsafe Rust Programs** This project aims to develop an ownership-based alias analysis as a complement to Rust's ownership type system for improving Rust's memory safety. This project, therefore, expects to deliver an alias analysis foundation that can provide stronger memory safety guarantees than the state-of-the-art in detecting memory-safety violations and security vulnerabilities in real-world Rust programs that use unsafe language features. The expected outcomes are a deployable ownership-based alias analysis in the Rust compiler and an industrial-strength open-source framework. These outcomes are expected to provide significant benefits in improving software quality and security in Rust, an emerging language that offers both performance and safety.	81,924.00	168,473.00	175,444.50	88,895.50	0.00	0.00	514,737.00			United States of America		
	National Interest Test Statement The Australian Cyber Security Centre has reported that cybercrime caused financial losses exceeding $33 billion for Australian businesses in FY2021, as evidenced by recent attacks and data breaches in the country. To maintain Australia's competitive advantage and safeguard national security, it is crucial to develop software using appropriate programming languages that enhance business performance while preventing security vulnerabilities. Rust, an emerging programming language recently adopted by major vendors such as Google, Microsoft, Dropbox, Facebook and Amazon, shows promise but suffers from security weaknesses. This project aims to address this issue by developing program analysis theories, algorithms, and associated software tools to significantly improve Rust's security guarantees for real-world applications. Such an initiative will bring substantial benefits to the Australian tech sector, including defense, finance, banking, retail, and communication, where efficient and secure software is essential. By open-sourcing all software tools developed in this project, the Australian tech sector will become more aware of the importance of adopting secure programming languages to prevent cyberattacks and minimise financial losses for businesses. This project will help Australia develop its core technology in software security analysis, thereby contributing to the Government's Cybersecurity Science and Research Priority.												
DP240103205 Gambin, A/Prof Yann	**Comparing properties of innate immune proteins of bats and humans** Supra-molecular protein complexes known as signalosomes drive our innate immune response by forming large signaling hubs capable of recruiting downstream effectors. This project aims to compare the properties and structure of human and bat signalosomes and discover the molecular origins of the "supra-immunity" of bats. In this context, the project expects to generate new knowledge concerning the fundamental molecular mechanisms that regulate the signalosomes. The intended outcome is to answer the long-standing	90,203.50	177,901.50	172,820.00	85,122.00	0.00	0.00	526,047.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	question of control of speed and amplitude of innate immune response at the molecular level. Both locally and internationally, this new approach should provide benefits across structural biology, molecular evolution and biotechnology. **National Interest Test Statement** The long-term goal of this project is to focus on the interaction between signalosomes and viral proteins. These molecular switches are so essential for the innate immune response that they are likely to be targeted by viruses during infection. The ability to target intracellular signaling pathways and redirect them to behave in a similar manner to that of bats could a paradigm shift in the way viral infections are treated. This research would provide new avenues to boost human defence and create molecular mimics that would block viral interference. This research project is designed to generate a broadly applicable toolkit and new paradigms for antiviral treatments. This project will position Australia at the forefront of molecular and biophysics research and will build capacity in cutting-edge technologies by creating novel enabling platforms for medical research. It will push researchers to develop interdisciplinary approaches to solve biological questions with innovative technologies, skills that will become essential to meet future biotechnology needs.												
DP240103246 Balleine, Prof Bernard W	**What is the role of striatal dopamine in value-based decision-making?** The aim of this project is to understand the role of dopamine in the brain circuits controlling goal-directed action. Its significance lies in our use of newly developed tools to measure dopamine release and cellular activity concurrently to assess the causal role of this interaction in choice and decision-making. The expected outcome of this project is to provide a comprehensive understanding of the role of dopamine release in striatal cellular activity and in the psychological processes mediating goal-directed decision-making. This outcome will have the benefit of filling a gap in our knowledge of the brain processes mediating decision-making, a fundamental capacity that contributes to our physical and psychological wellbeing (wellness). **National Interest Test Statement** The overarching aim of this project is to understand the brain circuits controlling goal-directed actions. Such actions are fundamental to decision-making and are heavily dependent on the interaction of the neural processes that mediate cognitive and emotional functions. We will seek to understand the role of dopamine in goal-directed action. Although dopamine is known to influence motor performance and some elements of learning, it is not known how its release influences specifically the learning and performance of goal-directed actions. A marked deterioration in such actions has been observed in cognitive dysfunction induced by normal aging and exposure to various stressors and is among the most debilitating problems facing our growing population. In Australia, cognitive and emotional dysfunction due to stress and ageing will only increase particularly given that the number of older individuals (over 65) will double by 2050. This makes research into this issue of the highest national significance. Amelioration of cognitive and/or ageing-related deficits in decision-making to which this research contributes will have significant economic benefits as well as improving the quality of life of these individuals and their families. To achieve this, we will seek to convey the outcomes of this research to industry to develop treatment, and to the broader community through the media and public talks to help to maximise understanding and adoption of this research in the future.	141,724.00	274,417.50	269,457.00	305,005.00	347,725.00	179,483.50	1,517,812.00			Japan, United States of America		
DP240103257 Kolotilin, Prof Anton	**The economics of (mis)information in the age of social media** New media technologies allow anyone to broadcast their views, leading to a “cacophony of voices” where misinformation flourishes. Tools from information economics are tailor-made for understanding information consumption in settings with many biased news sources. We develop economic models where many sources	18,394.00	49,633.00	68,170.00	57,395.00	20,464.00	0.00	214,056.00			United States of America, Scotland, Italy		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	compete to attract and influence heterogenous listeners. We then study how misinformation spreads and amplifies when consumers of information communicate with many others through a social network. Finally, we study how to design simple and robust rules to foster informative discourse and filter misinformation. The results will shape economic policy recommendations for regulating misinformation in media platforms and social media.												
	National Interest Test Statement												
	Recently, conspiracy theories such as QAnon and COVID misinformation have led to disastrous political and public health outcomes. In response, Australia has been active in addressing the spread of misinformation on social media, especially during the COVID-19 pandemic, and is considering new legislation to regulate the activities of media platforms in Australia. This project aims to inform and improve the design of policies for regulating media and information in Australia. Prior academic research has focused on idealised situations where the government fully controls a unitary information source; such assumptions do not capture the Australian media landscape, where consumers have access to a diverse range of mainstream, alternative, and social media sources, and where government agencies have limited measures for information control, especially over foreign media influences. In contrast, this project proposes theories and experiments that explicitly incorporate a multitude of information sources and impose realistic constraints on the tools available for information control. The results will be applied to develop a policy framework for evaluating tradeoffs that arise from media regulation, such as the balance between Australian national interests and core values such as freedom of speech. In doing so, the project aims to contribute to the ongoing debate over the scope and powers of the Australian Communications and Media Authority in regulating social media platforms.												
DP240103289	**Alkane transformations through binding to metals**	111,019.50	209,305.50	128,733.00	30,447.00	0.00	0.00	479,505.00					
Ball, A/Prof Graham E	Alkanes are fully saturated hydrocarbons and they are the major components of petroleum, including natural gas and liquid hydrocarbon fuels. They are abundant but finite, and their primary usage has been as fuels since they burn readily and release energy. Alkanes are relatively low-value, high-volume chemical feedstocks which are not easy to convert into more useful value-added materials. This project focuses on developing positively charged metal-based compounds that can bind directly to alkanes to increase their reactivity and enable their transformation into higher value products such as alcohols and olefins which are important chemical feedstocks.												
	National Interest Test Statement												
	The petrochemical sector (liquid petroleum products as well as gas) is one of Australia's largest industries. Most of our petrochemicals are burned to provide energy but this is changing as we transition away from fossil fuels. Methane is often also an unwanted by-product from oil production that is wasted and burned (flared) rather than used productively. Petrochemicals are relatively low-value, high-volume feedstocks which are difficult to convert to value-added products. Chemically, petrochemicals are relatively stable and inert. This research program investigates the design of metal-containing reagents to transform hydrocarbons (including methane) from petroleum into more valuable products such as alcohols and olefins. Technology from this project may (i) have direct economic benefit by finding alternative uses (and markets) for our petrochemical reserves in an environment where existing markets are declining; (ii) have a direct environmental benefit since it contributes directly to the reduction of burning of fossil fuels because petrochemicals can be directed to alternate uses; (iii) shore up and add resilience to valuable chemical feedstocks (such as olefins and alcohols) to service our chemical industries.												
	The University of New South Wales	3,298,067.50	6,712,824.00	6,584,772.50	3,358,721.50	368,189.00	179,483.50	20,502,058.00					

The University of Newcastle

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240100341 Giacomini, Prof Anna	**Transforming decision making for rockfall hazard assessment** The aim is to transform conventional approaches to rockfall hazard prediction and mitigation. The management of risks posed by rockfall in Australia currently comes at significant cost and is suboptimal; predicted environmental changes are likely to worsen these hazards. Rockfall mechanics, remote sensing, and data-driven modelling will be combined with advanced visual technologies to deliver a novel, rapid, and reliable augmented reality based rockfall hazard assessment tool. The outcomes are expected to streamline prediction, assessment, and mitigation – supporting practitioners and governments to proactively assess triggering conditions, evaluate risk, and apply robust solutions to improve safety, with substantial economic savings.	87,455.00	181,510.00	124,111.50	30,056.50	0.00	0.00	423,133.00			Canada		
	National Interest Test Statement Rockfall hazards have a significant impact on safety and economic growth in Australia and worldwide. A strategic research-based approach for their rapid assessment and efficient management is of prime importance to preserve Australia's infrastructure and public welfare from the impending hazards. With the impact of climate change, the rate and severity of extreme events is predicted to significantly increase and further intensify the vulnerability of rock slopes. The research will enable more sustainable and cost-efficient maintenance of Australian major transport infrastructure that would otherwise require long and costly interruptions and/or closures for extensive investigations and remediation works. Improving safety and efficiently managing natural hazards affecting transport infrastructure will unlock economic growth in areas with great potential, especially in remote and regional areas. The outcomes will be disseminated at industry forums and leading professional groups and will include an intuitive and reliable augmented reality tool that will be of great benefit to engineering consultants and designers in proactively responding to impending rockfall hazards, improve safety awareness and sustaining Australia's national infrastructure.												
DP240100514 McCluskey, Prof Adam	**Chemical staples and chemical probes to dissect dynamins cellular roles.** Modulation of protein structure drives cellular function. Dynamin GTPase forms at least two macromolecular structures with different cellular functions. The drivers behind these different structures is unknown. In this project we will leverage our discoveries, and planned enhancements, of chemical biology probes that will modulate dynamin activity by inhibiting at three distinct sites, and one site that stimulates dynamin activity. It is known that Dynamin helices and rings are believed responsible for at least three in cell biological functions: in hormone, neutral and receptor internalisation; cellular mitosis and in actin dynamics. Prior to this work we have lacked the tools to understand the role of shape modulation of protein function.	97,523.50	216,887.00	238,227.00	221,479.50	179,922.00	77,306.00	1,031,345.00			Germany, United States of America		
	National Interest Test Statement Protein shape drives protein function. Correct protein function is essential for life. Proteins that do not fold to the correct shape are unable function properly, often with devastating consequences. How and why proteins fold is largely unknown, in part because we have lacked the tools to unravel the intricacies of the process. We have identified a protein called dynamin that adopts multiple shapes each with different biological functions, as well as prototype chemical compounds that control its shape and function. Using chemical synthesis, these prototype chemical compounds will be transformed into a highly specific molecular toolkit capable of unravelling the												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	mechanisms of protein folding, shape and biological function. The future development of these tools will produce drugs that control protein shape and restore function by forcing adoption of the correct shape. Beyond the time line of this program, molecular level control of protein shape will usher in a new paradigm in drug discovery. Through our existing global research community and major drug company connections, these tools will have a global impact through increasing our understanding of, and ability to control, protein shape. The outcomes will ultimately be translated to new drug treatments with a direct impact on Australian society, economy and health. The control of protein shape offers untapped potential to tackle current healthcare challenges and some of the pre-eminent health issues of the 21st century.												
DP240100640 Coleborne, Prof Catharine S	**Life outside institutions: histories of mental health aftercare 1900 - 1960** This project aims to show that post-institutional care is central to the history of mental health before the era of deinstitutionalisation. It expects to break new ground by examining patterns of discharge from psychiatric institutions from 1900 to 1960, linking these with the development of mental health aftercare services for people leaving hospitals in Australia before these institutions closed. Planned outcomes of this project include a sole-authored monograph and co-edited book, a higher degree research thesis, and public engagement. This should provide significant benefits by connecting processes of institutional discharge to the wider community with later patterns of post-institutional care.	31,991.00	73,692.00	85,188.50	43,487.50	0.00	0.00	234,359.00			Scotland, England, Ireland, Japan, Canada		
	National Interest Test Statement This historical project uses hospital discharge data combined with post-institutional aftercare records to expand our understanding of mental health care between 1900 and 1960. There is little existing research into the post-institutional care of people with mental illness in the first half of the twentieth century. This project will explain how mental health aftercare supported the recovery of those experiencing mental illness including support for work or accommodation. Research into our health care heritage - past mental health strategies for community care - is important because mental health continues to be a significant social and health issue in Australia. Australia's health system can learn from the social and community responses to mental health aftercare before most large mental hospitals were closed in the final decades of the twentieth century; it also foregrounds why community solutions came into focus. The knowledge produced by this research is valuable because it will tell us about the range of novel alternatives to hospitalisation for the mentally ill. This is relevant now because most people now living with mental illness are treated outside the institution. The research will expand our understanding of the past and benefit students, researchers, medical professionals and the public by making historical materials and stories of mental illness accessible through a professional podcast series, a virtual exhibition, and written accounts of mental health care.												
DP240101279 Chapman, Dr Robert	**An in-built depolymerisation solution for polyethylene waste** This project aims to design enzymes that can be embedded into polyethylene, and later activated by the elevated temperatures of a compost heap, to depolymerise the plastic to small molecules. There are no good options available for the controlled decomposition of polyethylene waste at present, and instead researchers have focussed on solutions that rely on modifications to the underlying chemistry of the backbone and or collection to a central facility. Our approach would result in an in-built decomposition that does not require collection and recycling in a central facility. Since it is based on a depolymerisation mechanism it does not result in the production of harmful, partially disintegrated microplastics.	46,375.00	115,737.00	135,784.00	66,422.00	0.00	0.00	364,318.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	National Interest Test Statement Plastic waste is a huge problem. Up to 60% of the ~350 million tonnes of petroleum derived plastics produced globally each year end up in landfill or as microplastics in our waterways and soils. This project will embed specifically designed enzymes into polyethylene which will decompose the entire plastic to small molecules in the elevated temperatures of a compost heap. Our in-built mechanism bypasses the challenges of collecting waste plastic to a central facility, and requires no redesign of the underlying plastic. The resulting 'green' polyethylene would produce no microplastic pollution, reduce pressure on recycling infrastructure, and would be of significant economic value to local downstream manufacturers, who depend on the feedstock to make films, coatings, and other commodities. Australia produces ~275 kT of polyethylene each year in Sydney and Melbourne and our approach would be compatible with existing manufacturing infrastructure. We therefore envision future translation of the research findings in partnership with local industry.												
DP240102091 Mallavarapu, Prof Megharaj	**Understanding the risk of microplastics in Australian agricultural soils** Biosolids following wastewater treatment are a significant source of microplastics (MPs) that are contaminants of concern. MPs in biosolids pose potential unknown risks to agriculture, food security and ecosystem health through their application to farmlands. Currently, the lack of knowledge on the MPs contamination of agricultural soils is a significant knowledge gap. This project aims to generate new knowledge of MPs' fate, behaviour, risk and associated contaminants in biosolids and sludge-amended agricultural soils. The new knowledge generated in this project is expected to help devise better management options to minimise the MP associated risks in agricultural soils, thereby safeguarding the food security and soil health.	106,055.00	214,110.00	212,660.00	104,605.00	0.00	0.00	637,430.00					
	National Interest Test Statement Agriculture is the main primary industry in Australia with a net worth of $75 billion. Agricultural land is often amended with biosolids from wastewater treatment plants. These biosolids, although rich in nutrients and organic matter, can also deliver contaminants derived from the wastewater treatment process. This study will provide the first major investigation of the fate of the emerging contaminant, microplastics (MPs) in biosolids and biosolid-amended soils in Australia. The knowledge generated in this study will be incorporated into future protocols for Australian soil and water quality monitoring programs. The combination of our novel knowledge and technologies derived from this work will ultimately inform the removal of microplastics and associated toxic chemicals from biosolids and biosolid-amended soils to protect soil biota and crops bound for human consumption, thus protecting consumers from ingestion of these contaminants. Thus, assessing risk from MPs and providing recommendations on their removal from agricultural soils will protect and sustain an important Australian industry and also protect human health, future-proofing our food supply chain. Promotion of the findings of the research via media will educate consumers about the importance of clean healthy produce and foster confidence in product quality and safety.												
DP240102104 Meylan, Prof Michael H	**Mathematical and Numerical Models of Piezoelectric Wave Energy Converters** The project will investigate piezoelectric wave energy converters. We will derive the equations of motion in a form suitable for use in marine engineering paradigms using variational methods and then solve these analytically and with smoothed particle hydrodynamics. Using these innovative techniques, this project will generate new knowledge capable of elucidating the multifaceted physical phenomena that occur when complex fluid motion and deformable structures interact. The project outcomes include the development of mathematical and computation methods to handle	83,103.50	171,094.50	143,086.00	55,095.00	0.00	0.00	452,379.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	intricate behaviours of piezoelectric elastic-fluids systems. These groundbreaking methods will allow these wave energy systems to be analysed and their effectiveness assessed. **National Interest Test Statement** There is enormous energy in ocean waves around Australia, however developing cost-effective wave power devices remains an ongoing challenge. One emerging idea is to use flexible structures to capture this energy via piezoelectric materials that couple elastic strain with electric charge. If such devices can provide economically viable energy production, the outcome for Australia would be a new source of electrical power that has the potential to be significantly less expensive than existing renewable energy sources and is close to consumers living coastally. One of the major problems in developing these devices is the lack of mathematical models for flexible piezoelectric wave energy converters. Working with international partners leading experimental research into flexible wave energy converters, we will focus on the mathematical foundations underpinning wave energy extraction through the piezoelectric effect. Beginning by producing mathematical and computational models, we will analyse and suggest new wave energy converter designs. This successful theoretical demonstration will motivate further research and development of commercial prototypes. In particular, the direct involvement of marine engineers with extensive industry collaborations will help promote the translation of this work to the marine energy sector. Moreover, we will make our numerical methods available to wave energy convertor designers to facilitate their adoption in practical industrial settings.												
DP240102528 Vinu, Prof Ajayan	**Design of Nanoporous BCN with Tunable Pores for CO2 Capture and Conversion** This project aims to design and develop advanced boron carbon nitride-based materials with high specific surface areas, tunable pores and functional groups, guided by theoretical calculations for the capture of CO2 at ambient conditions. By introducing single metal atoms in the above nanostructures, we also aim to design a novel catalytic system for the effective conversion of CO2 into fine chemicals. This project will offer new knowledge on the design of low-cost advanced materials with specific functionalities for the simultaneous capture and conversion of CO2. This project will make a significant impact on Australian industries and further offer job opportunities and economic benefits by offering new technologies for a clean environment.	100,750.00	202,750.00	205,000.00	103,000.00	0.00	0.00	611,500.00			Japan, India, United States of America, Germany		
	National Interest Test Statement This project will develop low-cost advanced material technologies-based adsorbents and catalysts for the capture and conversion of CO2 molecules into fine chemicals. The outcome of the project will not only mitigate global warming but also support the economy. These nanostructures will also lead to the development of advanced zero-emission technologies and fine chemical industries. The idea of using largely available seawater for the fabrication of these nanostructures will significantly reduce the cost and support our local industries by creating thousands of jobs. This will also help to cultivate and nurture and young talents for Australia with advanced materials science technologies to translate greenhouse gas into high-value materials. This project will help address environmental problems and will, support the collaboration between domestic industries and further offer economic benefits by fostering the development of new industries. The project outcomes will also be disseminated through Climate Change - The World Economic Forum, social media and scientific conferences to maximise the adoption and provide a significant impact on clean environment technologies. Through existing industry partnerships, the project will translate the basic research into commercial outcomes by partnering with local industries that can supply these clean energy technologies nationally and internationally.												
	The University of Newcastle	553,253.00	1,175,780.50	1,144,057.00	624,145.50	179,922.00	77,306.00	3,754,464.00					
The University of Sydney													
DP240100208	**Making Better Decisions: An Investigation of Time-Biases**	57,507.50	112,028.00	101,064.00	46,543.50	0.00	0.00	317,143.00			United States		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Miller, Prof Kristie L	The aim of this project is to empirically and normatively evaluate two kinds of time-biases. Using an interdisciplinary approach, this project will empirically investigate near-bias and future-bias in a unified manner, and use this data to inform theorising about the rationality of time-biased preferences. The project will yield a rich account of the conditions under which we display time-biases and the likely mechanisms that underlie them. This project will determine whether, and when, time-biased preferences lead to sub-optimal outcomes, and lay the groundwork for determining which strategies mitigate these biases, leading to better decisions and outcomes. **National Interest Test Statement** Time-biased reasoning tends to lead to suboptimal decision-making in which the needs of our later-selves are undervalued. The costs of time-biased decisions to our later-selves include economic, health, and environmental costs. Time-biased reasoning leads to lower future wellbeing as individuals prioritise the wellbeing (economic, health, and otherwise) of their current selves over the wellbeing of their future (and indeed past) selves. It leads to poor environmental outcomes as we over-use resources now, to the detriment of our later-selves and future generations. Determining how best to mitigate time-biased reasoning will lead to better outcomes in decision-making situations in which we are trading-off costs or benefits that will accrue to our current selves as compared to our later-selves, or future generations. The benefits of the project include better outcomes for individual and collective decision-making by determining which conditions underlie (and can hence be attenuated in order to mitigate) time-biased reasoning.										of America		
DP240100249 Fenech, A/Prof Marianne	**Attracting, preparing, and sustaining quality teachers in early education** This project aims to address the chronic shortage of early childhood teachers in Australia, which is compromising quality and return on investment in early education. The project expects to generate new understandings about this specialist teacher workforce through an innovative, ecological, longitudinal design that will track early childhood teachers' career trajectories and develop a world-first tool to assess early childhood teacher quality. Findings are expected to inform policy— including the Australian Government-endorsed 10-year national Workforce Strategy and the Australian Government's Early Years Strategy— to support the future sustained supply of a quality early childhood teacher workforce and improve outcomes for young children. **National Interest Test Statement** Early childhood education in Australia is in crisis, with quality and return on investment hampered by chronic early childhood teacher (ECT) shortages, high turnover, and efforts to fast track the ECT pipeline without due consideration to graduate quality. This project will provide the evidence needed to identify solutions to these problems. By tracking ECTs from degree commencement to early career, and developing an innovative, world-first tool to assess ECT graduate quality, the project will provide new insights and strategies for policy makers, higher education institutions, and early childhood providers to build and sustain a quality ECT workforce. The project will inform the Australian Government's Early Years, Early Childhood Workforce, and National Teacher Workforce priority areas to enhance return on investment and better support the education, wellbeing, and development of Australia's youngest children. The project will also afford excellent research training with leading early childhood researchers. Project outcomes will be promoted through our established, extensive networks with sector stakeholders, and an international ECT workforce summit. The project will place Australia at the forefront of international research and policy needed to address an early childhood workforce crisis of national and global significance.	91,207.50	177,437.50	170,084.00	154,692.00	70,838.00	0.00	664,259.00			United States of America, England, Finland, Sweden, Canada, Ireland, New Zealand		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240100395 Leach, Prof Andrew S	**Mapping the Frontiers of Private Property in Australia** This project aims to develop a new DH dataset, systematically documenting and mapping the first generation of Australian private property ownership. The project expects to generate new knowledge of this phenomenon in New South Wales from 1788 onwards, using historical records to develop a digital map that shows where, when and to what extent parcels of land in NSW moved from Crown ownership into private hands. Expected outcomes include an open access map that will for the first time enable scholars to place the history of property ownership into conversation with other aspects of Australian history. Among its benefits it will enable future scholarly work and citizen engagement to effectively extend knowledge of Australia's property history.	70,703.00	145,967.50	155,921.00	80,656.50	0.00	0.00	453,248.00					
	National Interest Test Statement The value of present-day Australian residential real estate sales is estimated from Australian Bureau of Statistics data to be around A$250 billion per year. While we know much about the activity of transferring property from one owner to another, we know very little of the origins of this practice in Australia. The acquisition and transfer of property was one of the founding cultural and economic activities of Australian history from colonisation to the present day, and proprty remains a dominant source of wealth and security for many Australians. This research will locate Australia's enduring relationship with land and real estate historically, showing how the evolution of the aggregate national property portfolio grew in Australia's first decades, and showing how the pattern of property ownership intersected with international trade, conflict between colonial populations and between British and Indigenous Australians. Adding value to Government investment in the Time-Layered Cultural Map of Australia (LE1901000198), it will explain for the broadest audiences how property helped to make contemporary Australia. It will show the imbrication of property alienation with wider cultural debates in Australia, and especially as it concerns Indigenous Australians. In the year in which the Voice to Parliament is under debate, it will offer new tools to understand the relationship of the introduction of private property to the shape of contemporary Australian society and its debts.												
DP240100472 Fish, A/Prof Alexander	**Interplay between Ergodic Theory, Additive Combinatorics and Ramsey Theory** This project aims to address fundamental problems in Number Theory and Combinatorics by developing new innovative ergodic theoretic methods. Expected outcomes of the project include finding new patterns in dense subsets of trees, obtaining rigorous number-theoretic results emphasising the independence of addition and multiplication, finding infinite patterns in dense subsets of primes, and developing a multi-dimensional analogue of the dense model theory for primes. This project will provide significant benefits to Australian research via an intensive collaboration with best international and Australian researchers working in ergodic and number theory as well as will be used to educate a new generation of Australian students.	87,679.50	178,952.50	148,680.00	57,407.00	0.00	0.00	472,719.00			Sweden, Israel, United States of America, England		
	National Interest Test Statement In the late 1970’s mathematicians discovered deep connections between two seemingly unrelated topics in mathematics; that of Number Theory and that of Dynamics. Although the fact that the same ideas used to describe the motion of the solar system can be used to describe properties of the prime numbers is strikingly beautiful, this connection is not just of aesthetic importance. Indeed, our modern understanding of Number Theory and												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Dynamics underly the basis for much of modern technology, such as the internet, cryptography, meteorology or aerodynamics. This project aims to deepen our understanding of the connections between these two areas of mathematics, and clearly any progress in either area would contribute to the advancement of the technologies that rely upon them. Much of what we know about these connections between number theory and dynamics have only been discovered in the last 40 years, and there is certainly much that remains to be understood. Australia has many capable number theorists and dynamisists, however we have very few mathematicians working in the intersection of these two topics. This places us in a prime position to make important contributions to these significant areas of modern mathematics. This project will also contribute to educating new generations of Australian researchers by attracting honours and postgraduate students to modern fascinating areas of mathematics.												
DP240100489 Uy, Prof Brian	**Composite clad steel-geopolymer concrete systems for resilient structures** This project aims to develop innovative clad steel-geopolymer concrete composite members that will significantly improve the safe and economical design and construction of civil engineering systems. The expected outcomes will result in improved durability which has become a key issue in the economic justification of civil engineering infrastructure systems. Fire resistance in multi-storey buildings will also be improved through this project, and the coupled use of clad steel and geopolymer concrete in composite systems will reduce consumption and contribute toward Net-zero structural design. This will provide considerable benefits to Australian structural engineers and constructors in advancing their capability in composite construction.	87,401.00	184,932.00	197,451.50	99,920.50	0.00	0.00	569,705.00					
	National Interest Test Statement In Australia, it is estimated that corrosion damage costs up to $32 billion per annum (2.1% of GDP), which corresponds to more than $1,500 per capita in Australia every year. This project will develop durable, innovative and environmentally sustainable structural systems utilising geopolymer (reduced cement) concrete and structural clad steels for use in civil engineering infrastructure. The expected outcomes will include improved durability and fire resistance of buildings and civil engineering infrastructure which will result in significant savings to infrastructure to the entire community. Furthermore, the use of less cement and less steel will reduce carbon emissions and will help Australia move toward Net-zero in the structural design domain. The research will therefore provide economic, social, environmental and commercial benefits for the entire community. The results of this project will be translated into Australian Standards for buildings and bridges and will allow for easy adoption by engineers and the building construction industry.												
DP240100531 Lee, Prof Murray J	**Policing Australian Popular Music** This project will be the first comprehensive study of the relationship between policing and popular music in Australia. An interdisciplinary approach brings together criminology, music, history, social work, cultural, and music education research to investigate the processes by which certain forms of popular music and affiliated communities have been criminalised, and the ways musicians and musical communities have voiced resistance to police and state power. Through innovative interview and arts-practice based methodologies, the project will generate new knowledge on the historic and contemporary relations between state governance and creative cultural expression to inform policy and practice in policing as well as cultural investments.	100,000.00	155,600.00	105,600.00	50,000.00	0.00	0.00	411,200.00					
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	The Australian colonial nation state has always had a particular relationship to crime, with sovereign land stolen, and First Nations people policed, in order to build a penal colony based on punishment and redemption. Music has been inextricably involved with this history, with popular music holding complex associations with both state-construed criminality and community resistance. Australia's unofficial national anthem Waltzing Matilda is about a sheep thief who suicides rather than be taken by troopers; Aboriginal artists have historically been prevented from playing specific types of music. However, the policing of music is not just an historical issue with drill rap artists, festivals and dance parties still routinely over-policed, and hip hop and other popular music used in numerous redemptive correctional programs across the country. In the 1990s one of Australia's most popular performers Nick Cave made his name singing murder ballads, feminist singer-songwriters have voiced support for the #metoo movement, and First Nations hip-hop artists such as Dobby and BARKAA have resisted state power though the Black Lives Matter lens with songs like 'I can't breathe'. There is great national value and interest in uncovering, compiling and analysing the processes by which popular music is policed, and in exploring the power of music to resist policing in ways that might also initiate social change.												
DP240100602 Gulson, Prof Kalervo N	**Artificial intelligence in education: Democratising policy** The rapid introduction of artificial intelligence into education is occurring with inadequate policy support. Additionally, there is a lack of stakeholder input into decisions about the use of AI in education. Utilising social science and data science approaches, this project aims to democratise policy about AI in education by building tools to monitor policies, and developing collaborative policy making methods. The expected outcomes include publicly available policy resources to anticipate, and respond to, the role of AI in education, and participatory frameworks for policy making. The benefits include informed stakeholder engagement, and concrete policy recommendations that are globally relevant and adaptable to the Australian context.	92,027.00	147,179.50	159,297.50	104,145.00	0.00	0.00	502,649.00			Germany, Scotland, England, United States of America		
	National Interest Test Statement In 2022 the controversy over the release of ChatGPT showed how artificial intelligence is already shaping the future of education. Yet, the rapidly escalating introduction of AI in education is occurring with inadequate policy support. It is crucial that policies be developed to harness the transformative potential of AI in fair and ethical ways, shaping its development and use in ways that do not exacerbate harms for vulnerable populations in education. There is an acute need to provide education stakeholders with opportunities to contribute to the development of such policies - from legal regulations to local level guidelines - that both respond to and shape the use of AI. This Discovery Project will be instrumental in contributing to Australia's policy development regarding the ethical use of AI. This development involve diverse stakeholders in building policy tools, including education-specific algorithmic impact assessments and guidelines for the ethical procurement and use of education technology.												
DP240100615 Alù, A/Prof Giorgia M	**Mapping Creativity in Captivity during WWII** The project will map the little known cultural production by Italian Prisoners of War from 1940 to 1947. By analysing Italian detainees' creativity in Australia and elsewhere in the world, it will develop a new transnational approach to understanding the experience of captivity and of the many interactions between individuals and communities during WWII. The expected outcomes include new cross-cultural knowledge of migration and wartime experiences and of the beneficial power of creative action for individuals' wellbeing, still relevant today as we witness emergency lockdowns and peoples dislocated by wars. International collaboration and digital resources will bring the results beyond an academic audience to public and policymakers alike.	73,211.00	134,115.50	122,474.50	61,570.00	0.00	0.00	391,371.00			United States of America, Italy, India, South Africa, Japan, England, Norway		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement The cultural heritage produced by Italian prisoners of war and detainees in Australia during WWII demonstrates how creativity flourishes under conditions of dislocation and incarceration and foregrounds the cultural and artistic contribution of war-displaced people to Australia's development as a multicultural nation. This project will benefit Australians by enhancing understanding of the anxieties, aspirations and resilience of individuals and communities during wartime. Comparing the experience of Italian wartime detainees in Australia with those in other countries produces new knowledge about the transnational role of creativity. Public outreach and digital resources will fill an important gap in our historical narrative, helping Australia to make sense of our social and cultural diversity in ways that can inform education, arts programs, community action and policy initiatives. The project advances Australia's national interests by providing a better understanding of how individuals and groups interact in conditions of confinement, and the key role of creative action in promoting solidarity and kinship.												
DP240100697 McKee, Prof Alan	**Improving digital sexual literacy in Australia** This project aims to theorise digital sexual literacy in Australia and identify useful interventions aimed at increasing this literacy. We will map the ecosystem of digital Sexually Explicit Material (SEM) in Australia, identifying the ways in which Australians both consume sexual images and represent themselves as sexual beings in digital contexts. This data will be used to theorise digital sexual literacy, including both the "reading" and "writing" of sexual representations. The data will inform the formulation of useful interventions to support increases in digital sexual literacy in Australia.	58,367.50	112,181.00	115,844.50	62,031.00	0.00	0.00	348,424.00					
	National Interest Test Statement Following the passage of the 2021 Online Safety Act in Australia, the Office of the eSafety Commissioner has been granted additional powers to improve the online safety of Australians. The question of digital sexual literacy – that is, how Australians both consume digital sexual images and represent themselves as sexual beings in digital contexts - is a key part of such work. This project will provide valuable data to stakeholders including policymakers, public servants, sex educators, health promotion practitioners and researchers about the ways in which Australians are consuming and producing sexual representations in a digital context.												
DP240100725 Ashe, Dr Alyson K	**Discovering the molecular controls of epigenetic inheritance** This project aims to investigate the way in which acquired traits can be inherited. The environment that an individual is exposed to can change the characteristics of not only that individual, but also their children and grandchildren. We do not yet understand the mechanisms by which this "epigenetic inheritance" occurs. Using interdisciplinary approaches, this project combines the power of the model organism Caenorhabditis elegans with cutting-edge single molecule microscopy techniques to determine the molecular mechanisms by which the environment can impact future generations. This should ultimately provide society with the means to harness the power of epigenetics.	107,037.00	226,230.50	245,956.00	126,762.50	0.00	0.00	705,986.00			Japan		
	National Interest Test Statement This project aims to determine the molecular mechanisms by which epigenetic inheritance occurs. Epigenetic inheritance is, broadly speaking, the ability of the environment to alter the phenotype of not just the individual exposed to a that environment, but also their children and subsequent generations. Many examples of epigenetic inheritance have been described in a range of species. Most of these examples are in species that breed rapidly and can be grown under controlled conditions, but there are studies from humans that suggest epigenetic inheritance is also an important factor in human health. Equally as important is the role that epigenetic												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	inheritance may play in agriculture. For example, higher temperatures can have a deleterious effect plant growth. It is well known that epigenetic inheritance occurs frequently in plants, and higher temperatures can affect the impacted plants and their offspring. In many cases we do not know if the epigenetic inheritance will be protective or harmful. If the effect is harmful, understanding the mechanisms will allow us to prevent it. Conversely, if the effective is protective, we could harness epigenetics to help prepare future generations for a changing environment. This project will use a model organism to answer big questions about epigenetics, with far-reaching outcomes in applications such as agriculture and human health.												
DP240100781	**Mathematics for future magnetic devices**	89,499.50	184,665.00	151,492.50	56,327.00	0.00	0.00	481,984.00			Germany		
Goldys, Prof Beniamin	The aim of this project is to develop a mathematical theory and numerical models of stochastic partial differential equations for magnetic nano-structures. Such materials will yield next-generation magnetic memories with up to three orders of magnitude faster switching speeds and dramatically increased data storage density. New mathematical theories will help understand their sensitivity to small random fluctuations that can destroy stored information. This project aims to revolutionise mathematical modelling of magnetic memories and put Australia at the forefront of international research. Technological advances to create much smaller and faster memory devices are expected to enable groundbreaking ways of managing and mining big data												
	National Interest Test Statement												
	Magnetic memories are principal devices for storing information. Their next generation will require greatly increased access speed and data-storage capacity. This project will develop the mathematical theory of new magnetic memory materials, a crucial first step in their understanding and being able to finetune their properties. Numerical simulations of realistic systems will help to identify optimal designs, towards practical implementation. Ultrafast, high-capacity memories will underpin technological advances for the entire society and the economy, from new business solutions, better e-health, improved security for the Australian and global community, and faster internet. The project will foster the international competitiveness of Australian research, as it will generate publications in high impact journals. This will establish Australia as a world leader in nanomagnetics research, and expand the Australian knowledge base and research capability in mathematics. It will also incentivise long term collaborations with leading centres of research in Europe. Advanced training of students will provide them with expertise highly sought in the telecommunication industry, military institutions and in weather prediction. This will help maintain high standing of Australian Universities as destination centres of research and learning for domestic and international students.												
DP240100824	**Developing Accessible Playgrounds for Children with Vision Impairment**	58,557.00	129,173.50	140,459.50	69,843.00	0.00	0.00	398,033.00					
Reinhardt, A/Prof Dagmar I	Children who are blind or have low vision (BLV) often have difficulties accessing and interacting with playgrounds, most of which are not equipped to support them. Through consultation, collaboration and co-creation with the BLV community, foundational knowledge on the user experience of playgrounds, an evaluation framework for auditing existing playgrounds and design guidelines for creating or retrofitting playgrounds will be developed that support the unique challenges of BLV children and carers. Importantly it will promote access, orientation, physical and social play for BLV children, with improved cognitive, physical and social development, thus enabling a more inclusive and healthy society.												
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	Children with vision impairment have the right to a childhood that provides them with every opportunity to thrive and reach their full potential. However, these children face different and more challenges to their peers without disability. One challenge in which Australia lags is in providing public playgrounds that can be accessed by people with disabilities such as children who are blind or have low vision (BLV) and their families. The Government recognizes that access to urban open and public spaces should be universal for all people; one outcome described in the Australian Government's National Disability Strategy (2020) is that Australia must strive for inclusive and accessible communities. This project addresses this gap by investigating playgrounds as places for education, movement, health and community making. It evaluates existing strategies for enabling council, communities, and family to support and empower children with disability; produce knowledge, design tools, practice guidelines and novel play equiment. In doing so, this project should provide [who? playground designers, policymakers and urban planners with tools needed to create suitably accessible playgrounds], ultimately leading to more inclusive public spaces, better educational and social outcomes for blind and low-vision children and their families who can use these important spaces of learning, and ultimately a more equitable and cohesive Australian society.												
DP240100851 Shen, Prof Luming	**Unlocking self-healing bio-concrete through multiscale modelling** Self-healing bio-concrete, which uses bacteria as means to repair cracks, has the potential to revolutionise the construction industry and reduce the infrastructure repair and maintenance cost by billions of dollars annually. To unlock this, we need to understand the bacterial self-healing mechanisms for effective control of the performance. This project will develop a multiscale framework to describe the competing mechanisms between crack widening and healing at the macro-scale, incorporated with key information of substances diffusion and bio-cementation at the meso- and micro-scales. This will enable to optimise the self-healing of bio-concrete via design–test–learn approach and enhance the durability of structures under sustained loads.	85,565.00	171,130.00	176,130.00	90,565.00	0.00	0.00	523,390.00			England, United States of America, Netherlands		
	National Interest Test Statement Concrete is the backbone of our built environment; however, its lifespan is limited by deterioration induced by cracks under sustained loads. Costs to replace structures in fair condition will require from $106 billion to $138 billion in Australia. Self-healing bio-concrete, which uses bacteria as means to repair cracks, has the potential to revolutionise the construction industry and significantly reduce the infrastructure repair and maintenance cost. The development of bio-concrete, however, has mostly relied on trial-and-error based experiments and is hindered by the lack of models for revealing the underlying mechanisms of bacterial self-healing. This project will introduce a multiscale model to describe self-healing behaviour using coupled micro- and meso-scale models of chemical reactions and transport processes with macro-scale models of fracture mechanics. This project will unlock the self-healing modelling by delivering the much-needed framework to understand the mechanisms of bacterial self-healing and accelerate the development of self-healing bio-concrete by guiding experiments through the design–test–learn approach. This will enable the transition of self-healing bio-concrete into engineering practice, dominating the self-healing concrete market, which is projected to reach $6 billion in 2032, and to enhance the durability of infrastructure under sustained loads with significant economic benefits.												
DP240100872 Altmann, Prof Eduardo G	**Learning the meso-scale organization of complex networks** This project aims to model and learn the organization of online social networks. We will combine mathematical models, inference, and domain knowledge from computational social sciences to obtain interpretable descriptions of the role groups of users play in the network. The expected outcomes are new mathematical models and computational methods that learn from data how to best decompose a complex network into building blocks and their interactions, linking connectivity to function. This should provide benefits to industries and policy makers interested in how information spreads in	94,911.00	188,175.00	157,027.50	63,763.50	0.00	0.00	503,877.00			Austria		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	social media, including the critical questions of understanding the mechanisms contributing to political polarization and fragmentation. **National Interest Test Statement** This project will develop mathematical theory and computational tools that are needed to understand how large online complex networks are organized. Both the understanding and tools are of national interest because of the increasingly important role played by network data-analysis in the economy and by online social networks in the spreading of information. Social media is already one of the main sources of communication and information for the Australian population, with 75% of the population using it (with half as a source of news), and is at the core of some of the most important political debates in liberal democracies (e.g., spreading of misinformation, growth of political polarization) and particularly relevant in Australia (e.g., the role of misinformation in the 2019/2020 bushfire season and during COVID-19 vaccination). These are questions of great societal and economical interest in which fundamental research on online network is essential to complement research performed by social-media corporations. The knowledge and computational methods developed in this project will be made public and contribute to a transparent, ethical, and reproducible scientific investigation of these topics, aligned with the public and national interests. This project will also create capacity in the important field of Data Science, an area of economic interest and with a current shortage of personnel.												
DP240101086 Kalantar-Zadeh, Prof Kourosh	**Liquid metal solvents for high entropy and atomically configured systems** Significant challenges remain in developing high entropy alloys, which are future disruptors in metallurgy, ranging from configurational entropy to atomic ordering. To address such challenges, we will explore liquid metal solvents for synthesising high entropy and atomically configured systems from the combination of reactive and high melting point elements stabilised in metallic solvents. Molecular imprinting, mechanical and electrochemical triggers will control interfacial atomic organisation and precipitation. The growth mechanisms, both at the interface and in the bulk, will be explored by high energy probing techniques and computational simulations. We will offer new metallurgical paradigms for future catalysis and sensing concepts. **National Interest Test Statement** Australia is rich in mineral resources, particularly metals, and holds a dominant position as the world's largest producer. The ability to turn Australia's abundant metal resources into cutting-edge technologies through efficient and sustainable methods is vital to enhancing Australia's capacity to produce high-value and strategic products. In this regard, the development of advanced alloys is the next frontier for Australia's manufacturing sector. Advanced alloys and materials are of strategic global importance due to their unique combination of properties, including high strength, corrosion resistance, and improved thermal and electrical characteristics, making them suitable for a wide range of applications in various industries including aerospace, marine, transportation, energy and even household appliances manufacturing. Our recent discoveries show the possibility to access the manufacturing of advanced alloys and configurations at unprecedented accuracies and at low temperatures using liquid metals. However, still much more discoveries remain be achieved to make liquid metal technologies a reality for industries internationally. In this project, we will explore liquid metal solvent technologies to produce high-value advanced products at low energy consumption. The outcomes of this project will position Australia at the forefront of industries that deal with mining, materials transformation and creating added value products for multibillion dollar future ventures.	93,000.00	190,500.00	200,500.00	103,000.00	0.00	0.00	587,000.00			Switzerland		
DP240101159 Dijkstra, A/Prof Feike A	**Root effects on soil organic matter: a double-edged sword** This project aims to understand how plant roots build and destroy soil organic matter in grasslands and what the impacts are of drought. Soil organic matter is the largest terrestrial reservoir of nutrients for plant growth, but paradoxically, formation of new soil organic matter by plant roots also requires external nutrients. This	86,683.00	184,657.50	207,151.00	193,802.00	84,625.50	0.00	756,919.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	project will address this apparent paradox by using a new root-centric framework and stable isotope techniques. The project will use state-of-the art computer models that incorporate the latest frameworks on soil organic matter interacting with plant roots. Benefits include an improved capacity to manage and predict grassland productivity and soil organic matter dynamics with greater resolution and accuracy. **National Interest Test Statement** Grasslands in Australia store enormous amounts of carbon in their soils, and have the potential to soak up more carbon from the atmosphere to combat climate change. However, with prolonged droughts in Australia, there is much uncertainty how these large soil carbon pools will be affected. This project will examine the key role that plant roots have on forming and destroying soil carbon under drought and non-drought conditions. It will investigate management practices, including fertiliser use to store more carbon in soil via the activity of plant roots. Computer models will be used to make long-term predictions about drought effects on soil carbon. This project will provide important information to improve soil quality and food production, thereby benefiting the livestock industry in Australia. It strongly aligns with the Australian Government priority area in Soil and Water for a better understanding of sustainable limits for productive use of soil, as well as the Climate Change Policy for a better understanding and adaptation to climate change.												
DP240101295 Shine, A/Prof James M	**Evaluating the Network Neuroscience of Human Cognition to Improve AI** This project will translate the brain's inherent complexity into a set of explorable networks that will test the network theory of intelligence, and also be used to drive advances in next generation artificial neural networks. Our approach will catalyse new knowledge regarding how the complexity of the brain gives rise to cognition using innovative analyses inspired by physics and engineering. This fresh perspective on cognition will accelerate understanding of normal cognitive function and also advance the development of advances in artificial neural network performance. Expected outcomes include methods to describe the computational signature of how cognition emerges from dynamic brain network activity and novel AI algorithms. **National Interest Test Statement** Australia is an emerging world leader in human neuroimaging and systems neuroscience, and is ideally poised to play an even more impactful role in the near future. This project extends that leadership by addressing a major gap in our understanding of how distributed neural activity supports cognitive function. This will open new vistas in the understanding of brain function and how coordinated activity distributed around the brain is causally related to cognition and intelligence. The new knowledge gained will underpin new developments in treating brain disorders, the enhancement of artificial intelligence and the development of new principles of information processing, with potentially very large economic, commercial and social dividends. Maintenance of Australia's pre-eminence in neuroscience is an important cultural objective, and the new knowledge that will be gained has a high probability of underpinning new developments in treating brain disorders, the enhancement of artificial intelligence and the development of new principles of information processing, with potentially very large economic, commercial and social dividends. These benefits include increased efficiency of artificial intelligence algorithms, augmentation of advanced robotics and increased awareness of how our brain activity forms the basis of our capacity to make informed decisions. This will be achieved by integrating advances in systems neuroscience with modern artificial intelligence approaches.	102,376.00	260,414.00	324,406.50	166,368.50	0.00	0.00	853,565.00			United States of America, Germany, England		
DP240101313 Holmes, Prof Edward C	**Explaining virus diversity** To prevent virus pandemics, it is necessary to understand how viruses evolve. This project aims to reveal the long-term trends, processes and drivers of RNA virus diversity and evolution. Through the	121,484.50	245,267.00	238,004.50	114,222.00	0.00	0.00	718,978.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	metagenomic sequencing of the viromes of Australian animals that mark evolutionary innovations and transitions this project will reshape our knowledge of virus evolution and disease emergence. Expected outcomes will be a new understanding of how virus diversity is created, how virus phenotypes have changed through time, how often viruses jump to new host species, and how major events in animal evolution have shaped virus diversity. Key benefits include new measures of the viral burden faced by Australia's native animals and of ecosystem health. **National Interest Test Statement** Viral diseases pose an ongoing threat to Australian wildlife. The potentially devastating impact of emerging viruses makes it imperative to understand the factors that drive virus evolution and host jumping. We will address these issues by revealing the diversity, abundance and evolution of viruses in diverse Australian animals. Central to our proposal is understanding the viruses of Australian corals. Coral reefs in Australia and globally are in decline because of factors such as thermal stress events, pollution, predatory outbreaks and diseases. This decline is leading to a marked loss of biodiversity in marine ecosystems, with major environmental, cultural and economic sequences. Coral diseases are one of the most significant factors contributing to coral reef degradation. We will determine the natural virome of corals, a measure of ecosystem health, and whether corals are exposed to invasive viral pathogens. The research proposed here is strongly in the national interest because it will: (i) identify the viruses present in Australian animals, including such species as corals, starfish, sea urchins, tunicates and lamprey, providing a measure of their health status, and (ii) determine the factors that shape the long-term evolution of viruses, particularly their ability to emerge in new species. The data generated will transform our understanding of virus diversity, evolution and emergence, helping to protect Australia's unique fauna from devastating infectious diseases.												
DP240101353 Gudmundsson, Prof Joachim	**Algorithms for Future-Proof Networks** This project will design algorithms to construct, augment and route on geometric graphs in the presence of obstacles. Such graphs have many real-world applications, including transport networks. This project aims to give solutions with hard guarantees on the timeliness of the delivery of the people, goods, or information being transported in these networks. Expected outcomes of this project include efficient and innovative algorithms for realistic geometric graphs, which both advances the knowledge in this field of computer science and make our existing networks more reliable. This should provide significant benefits in the maintenance and utilisation of the communication and transport networks we use every day. **National Interest Test Statement** Real-world networks, such as digital or transport networks, are commonly modelled as graphs. Typically, one needs to build and maintain networks to effectively transport people, goods or information between nodes. The networks should be cost-effective and easy to navigate, and must avoid obstacles, such as buildings, parks, and lakes. As these networks form an integral part of our everyday lives and query operations on them need to be executed on large graphs (for example, Melbourne's transport network alone has almost 20,000 stops and more than a million connections), it is imperative that the algorithms operating on these networks function efficiently and effectively. Unfortunately, currently many of these operations are handled in an ad-hoc manner, or without giving hard guarantees on the performance. This project aims to develop algorithms to construct such efficient networks, maintain them, and design algorithms to find paths in them that allow us to give hard guarantees on the timeliness of the delivery of the people, goods, or information being transported. Such guarantees are of vital importance to real-time systems, such as delivery of medical supplies, where events need to occur within a given timeframe. The group will work with international experts and transport engineers to guarantee practical relevance and impact.	84,179.50	176,952.50	189,651.50	96,878.50	0.00	0.00	547,662.00			Canada, United States of America, Netherlands, Germany		
DP240101413	**Beyond pineal melatonin: sensing the seasons without the eye**	61,881.00	179,376.50	193,657.50	76,162.00	0.00	0.00	511,077.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Wade, Prof Claire M	The project will identify the causal connection between seasonal breeding in animals and a recently recognised brain biochemical pathway by applying experimental treatments mimicking seasonal environmental changes in a mutant and wild-type nematode worm model. Through experimentation we will identify useful biological targets that might be manipulated to enhance control of seasonal breeding in managed animals. With better control of reproductive output in animals, farmers and managers can increase and/or decrease reproductive output as needed in managed species including livestock and vertebrate pests. This will enhance the use of precious land resources and minimize ecological damage from overbreeding. **National Interest Test Statement** In a world concerned by the environmental impacts of animal production and reproduction, optimising the management of precious animal production resources in sensitive environments is critical. Annual seasonal changes affect many aspects of animal physiology. For example, in humans, seasonal affective disorder impacts our mental well-being and productivity at work. In farmed animals, seasonal fluctuations in physiology impact farm productivity and the input requirements of stock throughout the year. We will identify the key mechanisms by which a recently discovered biochemical pathway regulates seasonal breeding behaviour in animals. Knowing the precise mechanisms of control of the pathway will allow us to identify key biological targets that will provide opportunities for optimising resource management. With this control farmers will have new tools to supply animal products more evenly throughout the year, or better manage and control vertebrate pest species.												
DP240101464 Einav, Prof Itai	**A novel granular stress sensor for soil exploration** The project aims to develop a novel way to measure the state of soils and improve the perception of soft ground robots by combining advances in sensor development with granular physics. The project expects to produce new insights in geotechnical engineering by utilising innovative sensors compliant with the surrounding medium, thus improving measurements across broader deformation conditions than existing technologies. Expected outcomes include an increased ability to prevent soil failures by utilising these sensors to monitor stress levels underground. This should provide significant benefits for saving critical infrastructure from environmental and geotechnical failures, including landslides, tunnel collapses, and tailings dam damages. **National Interest Test Statement** This project aims to develop a ground-breaking solution to the significant shortcomings of current stress sensors, which cannot withstand harsh pressures and deformations. Unlike traditional sensors with solid parts, the project will address this gap by designing a novel family of sensors filled with granules. The ability of granular media to sustain deformation and switch between solid and fluid states makes the proposed sensors appealing for geotechnology and ground robotics. In geotechnology, these sensors could provide warnings ahead of potential soil failures that can compromise the resilience of critical infrastructure, thus preventing life-threatening consequences and environmental disasters, while reducing maintenance costs and benefiting the Australian economy. In soft robotics, they could help ground robots better sense and manoeuvre through challenging debris and rubble during search and rescue operations, and assist civil engineers in soil reinforcement and exploration. One significant outcome of this research will be the development of commercial-ready sensors. By the end of the project, the newly fabricated sensors could be deployed in trial studies by industrial partners. Moreover, we expect that the students involved in this project could help develop a spin-off company upon graduation, thus maximising the practical outreach of the sensors and promoting Australia’s higher education as a world-leader in geotechnical engineering and explorations.	65,565.00	131,130.00	141,130.00	75,565.00	0.00	0.00	413,390.00			Italy, Germany, Israel		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101563 Ubilava, A/Prof David	**Political Conflict, Inefficient Markets, and Food Crises** This project aims to investigate the effect of political conflict on food markets in low- and middle-income countries across Africa and Southeast Asia by utilizing granular data on ethnopolitical conflict, prices, and institutions. This project expects to generate new knowledge in the area of conflict studies using an innovative approach that allows eliciting disruptive effects of conflict by examining price relationships in spatially and temporally connected food and agricultural markets. Expected outcomes of this project include improved techniques to examine market inefficiencies in the wake of political conflict. This should provide significant benefits, such as creating an early warning platform for food crises in times of conflict.	30,000.00	65,000.00	65,000.00	30,000.00	0.00	0.00	190,000.00					
	National Interest Test Statement Foreign policy heavily relies on a good understanding of internal socio-political affairs in recipient countries. Australian policymakers have struggled to gauge the political and economic situations in low- and middle-income countries with high levels of conflict and poor governance. A lack of access to accurate data has been the main reason for this. The benefits of the project will be seen in improved data-driven assessments of political and economic situations, which will allow the Australian government to better target foreign aid and strategic investments, particularly in Southeast Asia and Africa. The project will provide greater insight into potential export markets in these regions, particularly for major cereals of which Australia is one of the world's leading exporters. The project will contribute to Australia's science and research priority of "Food" and help to drive economic growth opportunities for primary producers, particularly cereal exporters. The spatiotemporal market integration framework will measure how a country's institutions facilitate storage and trade in internal and external markets. The project will develop a forecasting tool to generate a real-time outlook on food affordability, particularly in the wake of internal and external conflicts. This tool will become an effective platform to promote research outcomes beyond academia, which includes informing policymakers of the risks of food crises and famines in historically susceptible regions.												
DP240101571 Tam, Prof Patrick P	**Assembling the building blocks in the blueprint of the embryonic head** This project aims to profile and impute the genome activity and validate the cellular and molecular mechanism underpinning the generation, in time and space, of diverse types of tissues that constitute the building blocks of the embryonic head. The knowledge gain enriches our understanding of the early steps of head formation during embryogenesis in the context of the niche conditions associated with the acquisition of progenitor state, enhancement of lineage propensity, and driving early lineage differentiation. Expected outcome of this research on the developmental biology of a model organism provides a framework of the mechanism of establishing a blueprint of development that may be conserved across multiple mammalian species.	117,828.50	252,443.00	255,685.00	121,070.50	0.00	0.00	747,027.00					
	National Interest Test Statement Orchestration of the development of major body parts of the embryo underpins a healthy start of life. This multidisciplinary program delineates the molecular and cellular mechanism underpinning the emergence of diverse tissue types during development of the mouse, a road-tested mammalian model organism. The outcome of this research will enrich our understanding of the developmental process of the mammalian embryo and fills a gap												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	of the knowledge of the blueprint of embryo development. The new Information provides insights into the cellular and molecular mechanism of the formation of a major body part, the head of the mouse embryo. The text-book knowledge of the blueprint of mouse development will inform how development of other mammalian embryos, including those of the primates, is regulated, and guide the strategy of discovery research on human development in health and diseases, such as the elucidation of the biomarkers for monitoring fetal health and the identification of casual mechanistic factors leading to birth defects. The computational research enables the development of bioinformatics methodology and pipelines for the integrative analysis of single-cell multi-omics datasets across many biological disciplines. These analytics tools will enhance the data analytics capability of the genome research community and the data science industry.												
DP240101572 Molev, Prof Alexander I	**Quantum algebras with supersymmetries** The project aims to make fundamental advances in the theory of quantum algebras. It will develop explicit structure and representation theory of major classes of quantum algebras which are of great importance to quantum field theory and integrable models with supersymmetries. The intended outcomes include a solution of the outstanding classification problem for representations of quantum algebras with supersymmetries, which has remained open for the last two decades. It will involve newly-developed methods within the theory of quantum groups, and both the methods and classification will bring new mathematical instruments for the advance of supesymmetric conformal field theory and soliton spin chain models.	73,203.00	150,967.50	120,593.00	42,828.50	0.00	0.00	387,592.00			United States of America, France		
	National Interest Test Statement Modern advances in mathematics and physics have underpinned many recent breakthroughs in information technology. This project will fill a long-term gap in our knowledge of physical systems by employing mathematical framework of enhanced symmetries. Researchers and engineers in the computing and telecommunications industries will be able to make use of the results of this research to develop new high-tech computers and information systems. Additionally, the quality of research and education in science and mathematics is one of the pillars of a competitive economy. The project will add to Australia's achievements in excellent, cutting-edge research and provide opportunities for higher-level mathematics students to gain experience with contemporary research in pure mathematics. It will maintain Australia's prestigious international standing in representation theory and mathematical physics, enhance ties with the research network by bringing high-profile international leaders and promoting Australia's research strengths in the areas.												
DP240101809 Mathas, Prof Andrew	**Categorification and KLR algebras** AIMS This project will solve three problems at the forefront of representation theory: the centre conjecture for graded Hecke algebras, concretely connecting crystals with KLR algebras and describing the grading and radical filtrations Specht modules. SIGNIFICANCE Solving any of these problems will represent a serious advance in the field and have a lasting impact and creating new areas of research. EXPECTED OUTCOMES We will remove major bottlenecks in our understanding of KLR algebras. BENEFITS In addition to the mathematical benefits, the skills and expertise that are required for, and will be enhanced by, this project are readily transferable and highly sought after by industry, including the financial, IT and education sectors.	99,352.00	201,770.00	162,832.50	60,414.50	0.00	0.00	524,369.00			Germany, China (excludes SARs and Taiwan), England, Japan, United States of America		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Mathematics is essential to our society. It is the language that underpins science, engineering and all of our technological advances. The benefits that mathematics bring to society range from forming the basis of the knowledge economy, to enabling the information technology, to underpinning pivotal advances in engineering, and being a vital component of the world's financial markets.. The project will strengthen our international collaborative links by bringing high profile international mathematicians to Australia to work on this project and to give seminars. By training postgraduate students and post-doctoral researchers we will add to Australia's research expertise and capabilities. This project addresses fundamental unsolved problems about the cyclotomic quiver Hecke algebras, which are a new class of algebras that are central to modern developments in mathematics.. We expect to reveal deep connections between these algebras and crystals, to use Rees deformation techniques to understand their centres and to exploit these tools to better understand their representations,. This project will further cement Australia's reputation as a world leader categorification, algebraic combinatorics and representation theory. Finally,we will forge new links between research teams in Australia and Germany, which will boost our productivity.												
DP240101820 Thornber, Prof Ben J	**Harnessing the Power of Wind: Revolutionising Wind Farm Optimisation** This project aims to develop a rigorous, efficient and accurate framework for optimisation of control policies for complete wind farms. It expects to generate new knowledge in data-driven physics informed transient aerodynamic and structural modelling of entire wind farms, generation of low order yet sufficiently accurate models using machine learning, and game-theoretic and model predictive control techniques for operation of an entire wind farm. Expected outcomes are engineering tools to tackle wind farm inefficiencies totalling $700m/year in Australia alone, contributing to energy stability, security and lowered emissions aligned to the National Science and Research Priority 'Energy'.	71,303.00	158,199.00	167,599.00	80,703.00	0.00	0.00	477,804.00			Germany		
	National Interest Test Statement Wind farms powered the equivalent of more than 5 million Australian homes, 12.5% of the total power generated in 2022. Australia's long term emissions reduction plan expects to see at least a doubling of this production by 2030, with similar statements to state-led strategies. However, it is estimated that inefficiencies in current wind farm operations contribute more than 20% of the cost of energy production. Existing wind farm operational models are not sufficiently accurate to underpin accurate control and optimisation. Bringing together world leading research in aerodynamics, structural dynamics, power systems, machine learning, control and optimisation, this project will develop and prove a high fidelity wind farm optimisation framework. This framework would help tackle $700m of inefficiencies across Australian wind farms each year. This project includes a NSW wind farm case study provided by the number one producer of wind power in the world, Iberdrola. This will accelerate the research translation pathway to enable efficiency improvements and wind energy cost reductions in Australia and worldwide.												
DP240101848 Xu, Dr Chang	**Generative Visual Pre-training on Unlabelled Big Data** This project aims to develop a generative visual pre-training of large-scale deep neural networks on unlabelled big data. Developing pre-trained visual models that are accurate, robust, and efficient for downstream tasks is a keystone of modern computer vision, but it poses challenges and knowledge gaps to existing unsupervised representation learning. Expected outcomes include new theories and algorithms for unsupervised visual pre-training, which are anticipated to deepen our understanding of visual representation and make it easier to build and deploy computer vision applications and services. Examples of benefits include modernising machines in manufacturing and farming	83,500.00	168,500.00	171,500.00	86,500.00	0.00	0.00	510,000.00			Hong Kong (SAR of China), Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	with visual intelligence. **National Interest Test Statement** Australian businesses, government agencies and the general public are increasingly concerned with the most cutting-edge AI technology, growing and attracting the world's best AI talent, and using AI to solve significant national challenges. But when innovations are happening at a break-neck speed, concentrating efforts on building every module of an AI system could prove counterproductive, setting companies back financially, especially start-ups. Advanced visual pre-training techniques and models from this project can simplify and accelerate the development of intelligent vision systems, which will benefit local industries and make Australia more worldwide competitive. Pre-trained visual models can be adopted as backbones in various downstream vision tasks, e.g., image classification, object detection, and segmentation. They could be called on to help us fight disasters such as wildfires, storms, and floods by, for example, linking remote monitoring systems (e.g., hyperspectral images) and helping responders detect issues early. Drones can harness computer vision systems to map, monitor, and plan food production, allowing farmers and growers to assist them in efficiently planning their fields to maximise harvests and reduce waste.												
DP240101869 Cesare, Prof Anthony J	**Understanding Mitotic Telomere Deprotection** This project aims to study telomeres, the DNA and protein structures that protect chromosome ends. During cell division, cells under stress intentionally uncap their telomeres. This project expects to generate new knowledge that challenges the conventional notion of telomeres as static elements, showing instead that telomeres can be dynamic signalling hubs. Expected outcomes of this project include an understanding of the genetic, proteomic, and signalling pathways involved in this novel phenomenon. This should provide significant benefits to our fundamental understanding of biological processes that protect human genomes and provide a valuable dataset for research on telomere biology, DNA repair, and genome stability.	113,284.00	231,119.50	238,667.50	120,832.00	0.00	0.00	703,903.00			Japan, England		
	National Interest Test Statement Telomeres are essential biological structures that normally cap and protect chromosome ends. This research project aims to elucidate the novel mechanism of "mitotic telomere deprotection", where telomeres are actively uncapped in response to cellular stress. The project challenges conventional belief that telomeres are static features, suggesting instead that telomeres can serve as dynamic signalling elements that propagate cell outcomes. The study will contribute fundamental knowledge in telomeres, genome stability, and DNA repair, benefitting the Australian biotechnology and pharma industries. This understanding will also contribute to technological development of tissue engineering and in the cellular production of biological materials. The publicly available interactomics data set generated from this study will be an invaluable resource for Australian telomere and genome stability researchers. This project will also train the next generation of researchers in advanced technology, including super-resolution microscopy, proteomics, and molecular biology, contributing to Australia's growing biotechnology sector.												
DP240101919 Zhou, Prof Dingxuan	**Approximation theory of structured neural networks** Mathematical theory for deep learning has been desired due to the power applications of deep neural networks to deal with big data in various practical domains. The main difficulty lies in the structures and architectures imposed to networks designed for specific learning tasks. Neither the classical approximation theory nor the recent one for depths of ReLU neural networks can be applied due to the structures imposed for processing large dimensional data such as natural images of tens of thousands of dimensions. This project aims at an approximation theory for structured neural networks. We plan to establish mathematical theories for deconvolution with	75,703.00	158,467.50	125,542.50	42,778.00	0.00	0.00	402,491.00			United States of America, Germany, Hong Kong (SAR of China), China (excludes SARs and Taiwan), Italy		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	deep convolutional neural networks, operator learning, and spectral graph networks. **National Interest Test Statement** Australia has been a world-leader in the research of kernel-based learning theory and a driving force in deep learning studies. The recently developed fields of data science and data analytics raise the need of a rigorous mathematical theory for designing robust and explainable deep neural networks for dealing with big data. The recent investment of one billion dollars from Google to Google Australia is an example, where one of the three strategic areas to invest in research is machine learning fundamentals. This project is along this direction and provides fundamentals for deep learning of big data. When the dimension of the data like natural images is of tens of thousands, structures and architectures need to be imposed to reduce the computing complexity for specific learning tasks. The classical approximation theory or the recent one for depths of ReLU networks does not apply to such situations. The approximation theory for structured neural networks we plan to establish in this project will solve some challenging problems and provide theoretical clues for designing structures and architectures of deep neural networks according to various practical applications, from speeches, images, to natural language processing. Our research findings can not only answer some questions of why deep neural networks are super-efficient, but also provide methodologies and new deep learning algorithms for solving some practical problems arising from industry, economics, and social studies.												
DP240101927 Tymula, Prof Agnieszka A	**Multidisciplinary analysis of financial reference points and wellbeing** The aim is to find how to improve financial decisions (i) during unexpected economic shocks, and (ii) by the socially disadvantaged. The project will produce the first large-scale evidence on heterogeneity in benchmarks (reference points) against which people evaluate financial alternatives and the role of such benchmarks in financial risk-taking and in creating and perpetuating economic inequality. The expected outcomes include transformed interdisciplinary understanding of financial decisions and significantly greater capacity for multidisciplinary collaboration. The findings will inform policy on promoting financial wellbeing and to mitigate the devastating effects of sudden economic shocks such as that of COVID-19.	53,191.50	109,270.00	111,248.00	55,169.50	0.00	0.00	328,879.00			United States of America		
	National Interest Test Statement Currently, many Australians are experiencing the economic consequences of COVID-19 which affect their financial decision-making. Sudden changes in the economic climate affect people's perceived financial options, willingness to take risks, degree to which they want to avoid loss, and propensity to make mistakes in decisions. Based on recent discoveries in neuroscience about how the brain incorporates past experience into current perception, this project will develop and test new theories of how people's past economic experiences influence their subsequent economic decisions,. This can provide a scientific foundation to improve the financial wellbeing of all Australians. Important insights into financial behaviour in the post-pandemic path to economic recovery in Australia will help prepare for the next crisis.												
DP240102076 Silver, Dr Natalie S	**Superannuation as Inheritance: Law, Practice and Reform** Given that Australian retirees are leaving behind billions of superannuation assets for inheritance, this project aims to obtain accurate real world findings about how superfunds distribute superannuation inheritances in practice. Current law has not kept pace with reality, largely leaving superfund trustees to decide how to bequest their deceased members' excess superannuation. Australian families are at the mercy of superfunds. The expected outcomes of this project include evidence-based proposals to reform industry	43,269.50	59,508.50	41,294.50	25,055.50	0.00	0.00	169,128.00			United States of America, England, Scotland		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	practice and the law. These reforms will promote respect for Australians' testamentary wishes, safeguard against abuse, and advance societal interests in philanthropy, wealth equality and fiscal responsibility. **National Interest Test Statement** Superannuation was designed to provide retirement income but most retirees now die with 90 percent of their superannuation balances intact, leaving the excess superannuation to others to inherit. Australians inherited $17 billion of superannuation assets in 2019, an annual figure projected to reach $130 billion by 2059. Unfortunately the law concerning the inheritance of superannuation is outdated and minimal. The law essentially gives all the power to superannuation trustees, leaving Australian families at the mercy of their superannuation funds. This comprehensive empirical study of superannuation fund deeds, policies and administration will discover for the first time in the world how trustees use their discretion to distribute superannuation inheritances in practice. Guided by these discoveries, the project will develop industry best practice and law reform recommendations to better ensure that superannuation fund trustees respect individual testamentary wishes, safeguard against financial misconduct, and advance societal interests. Through consultation process involving industry and government, this project will maximise the understanding, use and adoption of its findings. The project's findings and recommendations can be adopted by superannuation funds themselves, delivering immediate benefits to Australian families and society. The law reform and policy recommendations can be adopted by Parliament and oversight bodies.												
DP240102119 Mackay, Prof Joel P	**How does the chromatin remodeller CHD4 regulate gene expression?** The mechanisms that determine how genes are switched on and off in different tissues and at different times are in many ways still mysterious. It is well established that gene expression patterns in complex organisms are determined in part by the manner in which DNA is physically packaged. Our aim is to define new aspects of these mechanisms that revolve around molecular motors that regulate DNA packaging. This foundational knowledge will deepen our understanding of gene regulation in all complex organisms and will inform future efforts to rationally modulate gene expression patterns in agriculture, research and other important areas. **National Interest Test Statement** This application investigates one of the most fundamental and long-standing questions in biology – how does an organism 'read' the right parts of its genome at the right times and in the right places to develop and thrive? The answers to this question are largely shared by all complex organisms, ranging from fungi to plants and animals and beyond. The delineation of the mechanisms by which the genome is interpreted will have significant implications across medicine, agriculture and biotechnology. As well as providing a deeper understanding of the world around us, determination of these mechanisms will potentially enable the Australian agricultural industry to deliver more efficient and higher-quality agricultural production and provide new avenues for the Australian biotechnology sector to develop innovative approaches for the treatment for a range of human disorders. Important examples already exist of such applications and a stronger grasp of the underlying mechanisms will significantly expand our opportunities to have economic, therapeutic and agricultural impact.	100,308.00	215,685.00	274,521.00	174,624.00	15,480.00	0.00	780,618.00			England		
DP240102161 Calamante, Prof Fernando	**Novel tractography-guided MRI methods for studying healthy brain ageing** Advances in imaging, and particularly Magnetic Resonance Imaging, have opened a new era in the study of the brain enabling a myriad of neuroscience discoveries. This project aims to develop new analysis methods to study and understand the variability in the human brain during ageing, exploiting the wealth of information contained in the so-called tractogram, a mapping of the brain's wiring. This project expects to	75,500.00	146,250.00	159,131.50	88,381.50	0.00	0.00	469,263.00			Wales, France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	develop innovative imaging biomarkers to characterise the brain changes in the course of healthy brain ageing. Expected outcomes include novel imaging tools for neuroscience, which should allow us to map trajectories of normative healthy brain ageing and use them to identify lifestyle factors that impact these trajectories. **National Interest Test Statement** Advances in imaging continue to revolutionise neuroscience, enabling countless discoveries. We aim to develop new imaging tools to study the human brain by exploiting the wealth of information from mapping the brain's wiring obtained using Magnetic Resonance Imaging, an area that has been highly underexploited. This will allow us to combine imaging data to create a 'brain fingerprint', which we will use to characterise the changes in the course of healthy brain ageing, akin to growth charts used in children development. There is an unmet need for methods to track an individual's brain changes and how normal deviations from average trajectories relate to functioning and wellbeing. We will use the brain fingerprint to explore lifestyle impacts on healthy brain aging. The methods and new knowledge from this proposal will have major economic and social benefits. Firstly, they will help better understand behaviour so that the human organisation and activity can be improved. Secondly, the technology can be used to study brain aging and healthy ways to use the brain. Our tools can also be used to better understand brain development, so that education can be optimised. The lifestyle of Australians can thus be optimised. We will disseminate our methods through publicly releasing our software tools, an strategy that has proved successful in ensuring our innovations are widely adopted, including beyond academic (such as for clinical management, informing guidelines, and industry).												
DP240102805 Lo, Prof Nathan	**Testing links between life-history and genome evolution** Chromosomes are fundamental units of inheritance. They often differ in number, size and structure between species, and may also differ between individuals within a species. The evolution of chromosomes is tied to that of organisms themselves, making them important for understanding the generation and maintenance of biodiversity. Yet, our understanding of the forces that influence chromosome evolution remains limited. This project will investigate the formation of unusual chains of chromosomes that are increasingly being found in various vertebrate and invertebrate taxa, using an organism in which they are most commonly found: termites. We will test the hypothesis that inbreeding drives the evolution of meiotic sex linked chromosomes. **National Interest Test Statement** Chromosomes play important roles in speciation and the generation of biodiversity, yet our understanding of chromosome evolution remains poor. The results of the study will improve our understanding of the evolutionary processes that produced the remarkable diversity of the present-day Australian fauna and other fauna globally. The project will generate genomic resources for a pest species of Australian termite, as well as the only known species that has all-female colonies, which will be of potential use in the future development of sustainable methods for controlling them. A number of human diseases are associated with errors during the segregation of chromosomes during meiosis, the process during which gametes are formed. The project will increase our understanding of how and why chromosomes become linked during meiosis. The project will strengthen important international links with researchers in Japan, and will build on collaborations with researchers across Australia.	91,941.00	188,780.50	195,077.50	98,238.00	0.00	0.00	574,037.00			Japan		
DP240103193 Gamble, Prof Jennifer R	**Cellular Ageing: Is the Plasma Membrane the Control Hub?** This project aims to determine whether the plasma membrane lipid composition is a major driver of cellular ageing. It expects to generate new knowledge in the molecular mechanism of cellular ageing, utilising our team's deep expertise in lipid biology, bioinformatics,	115,207.50	227,965.00	239,649.50	126,892.00	0.00	0.00	709,714.00			China (excludes SARs and Taiwan)		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	biophysics, extracellular vesicle biology and cellular ageing. Expected outcomes include the identification of novel cellular ageing markers and anti-ageing targets while also cementing long-standing partnerships and fostering new interdisciplinary collaborations. This cellular ageing study will provide novel insights into the basic principles of cellular behaviour, e.g. growth, differentiation, communication and death, reinforcing Australia's leadership in biological science.												
	National Interest Test Statement												
	Australia's population is rapidly ageing, with nearly one-quarter expected to be aged 65+ by 2066. The ageing population has a high prevalence of chronic diseases, which is projected to triple the health cost per capita over the next 40 years. The high morbidity associated with ageing has severe consequences on economic growth, workforce productivity, family dynamics and community resources. Thus, the aim for the future is to age 'healthily'. Ageing at the cellular level determines the health span and lifespan of individuals. Our focus is on the blood vessels, as it is said that we are "only as old as our blood vessels". Our project aims to address the knowledge gap in the underlying consequences of the ageing of the vessels, specifically in one of the primary cells of our blood vessels, the endothelial cells. This project aligns with the national interest in promoting healthier ageing and reducing the socioeconomic burden of age-related diseases. To maximise the impact of our research beyond academia, we will disseminate our findings to consumer groups and leverage social media to reach a broad audience and raise public awareness of healthy ageing. The new anti-ageing targets exposed from this project will also be related to medicinal chemists and to biotech and pharmaceutical companies to further translate our knowledge.												
DP240103324 Tao, Prof Dacheng	**Quantum Generative Diffusion Models for Molecular Research** This project will devise quantum generative diffusion models to equip classical counterparts with the ability to harness quantum data that naturally arise in molecular research. Theoretical foundations for analysing fast sampling methods with the help of inductive bias regarding the input data and employed circuits will validate efficient quantum generative diffusion models that have training and sampling advantages over classical counterparts. Outcomes include applications in molecular conformation generation, compound screening, and drug design. The innovative research will significantly benefit Australia's science, industry and health, and will maintain Australia's global leading role in quantum machine learning and molecular research.	85,565.00	172,630.00	175,630.00	88,565.00	0.00	0.00	522,390.00			Taiwan		
	National Interest Test Statement												
	Machine learning have revolutionised data-driven research and industry in the last decade, albeit at high computational costs. Meanwhile, quantum computing has made significant strides, with quantum error-correction and quantum advantages on certain tasks being realised. This has spurred the development of quantum machine learning to exploit these advantages for machine learning problems, such as combinatorial optimisations and chemical or biological tasks. This project will develop quantum versions of generative diffusion models to realise these advantages for molecular research. The proposed research aligns with Australia's national research priorities for better models of health-care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure. A novel QGDM, compatible with scientific quantum data, will improve the efficiency of many impactful applications in the fields of chemistry and health research and their associated industries. The research can yield improvements to molecular conformation generation, compound screening and drug design.												
	The University of Sydney	2,997,998.50	6,122,620.50	6,145,955.00	3,192,276.50	170,943.50	0.00	18,629,794.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
University of Technology Sydney													
DP240100181 Chang, Prof Xiaojun	**Mitigating the Influence of Social Bots in Heterogeneous Social Networks** This project aims to mitigate the influence of social bots in dynamic and constantly changing social networks. Social bots can spread misinformation, manipulate public opinion, and compromise privacy and security. This project will use advanced algorithms to detect and neutralize the impact of social bots, improving the integrity and accuracy of information on social media. The expected outcomes include the development of a robust system for identifying and mitigating social bot influence, and the reduction of harmful content and misinformation on social media. The benefits of this project include a more trustworthy and secure social media environment, protection of individuals and organizations from malicious activities.	80,685.00	163,870.00	171,370.00	88,185.00	0.00	0.00	504,110.00			United States of America, Canada		
	National Interest Test Statement Social bots are automated accounts that can manipulate public opinion, spread misinformation, and undermine the integrity of social media. In today's interconnected world, the impact of social bots can have far-reaching consequences, including affecting the outcome of elections, spreading false information during times of crisis, and damaging the reputation of individuals and organizations. Furthermore, the rise of social bots also has implications for privacy, security, and cybersecurity. Social bots can be used for malicious purposes such as spreading spam, phishing, and malware, and can compromise personal and sensitive information. In dynamic and constantly changing social networks, the challenge of detecting and mitigating the influence of social bots becomes even greater. This highlights the need for robust solutions that address this issue and develop effective strategies for mitigating the influence of social bots in social networks. This will ensure the integrity of social media, protect the public from misinformation and harmful content, and secure the privacy and security of individuals and organizations. To this end, the outcomes of this research, will significantly enhance bot detection, and be widely disseminated in publicly available forums, including workshops and tutorials.												
DP240100370 Seymour, Prof Justin R	**Defining the links between climate change, marine disease and food security** This project will deliver critical new knowledge on the causes of marine pathogen outbreaks that threaten Australia's $1.6 billion aquaculture industry. Several members of the same genus of bacteria have been implicated in recent mass mortality events in aquaculture species, as well as human illness in consumers of seafood, yet the triggers for unprecedented outbreaks of these pathogens are unknown. By coupling a suite of sophisticated molecular biological tools and physiological measurements, this research will resolve the role of environmental disturbances including marine heat waves, floods and plastic pollution in stimulating marine pathogen outbreaks, thereby informing efforts to safeguard Australia's food security and food safety.	124,092.50	247,774.00	253,220.50	129,539.00	0.00	0.00	754,626.00					
	National Interest Test Statement This project will focus on identifying the environmental triggers for devastating disease events in oyster aquaculture farms and outbreaks of severe illness among seafood consumers. Oyster farming is one of the most												

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	valuable sectors of Australia's aquaculture industry, with more than 500 oyster farms contributing over $114 million to the economy each year, while producing one of the nation's favourite and most nutritious seafoods. The industry also supports thousands of Australian jobs, often in regional communities. However, oyster aquaculture has recently been heavily impacted by disease outbreaks, which have caused millions of dollars in lost profit, and the complete cessation of oyster farming in some areas. More recently, seafood poisoning among consumers of Australian oysters, has put even further strain on the industry, while also threatening public health. This project will reveal why episodic outbreaks of the pathogens responsible for oyster disease and seafood poisoning occur, and identify the environmental conditions triggering these detrimental events. The project's results will be communicated to the oyster aquaculture industry to deliver critical new capacity to forecast pathogen outbreaks and develop management strategies to minimise impact, including within burgeoning indigenous aquaculture enterprises. These outcomes will help to protect the profitability of an iconic Australian marine industry, while also safeguarding our nation's food security and safety.												
DP240100614 Wang, Prof Qilin	**A Green Technology for Enhancing Resource Recovery from Sewage Sludge** This project aims to develop an innovative technology to recover valuable resource from sewage sludge by enhancing transformation of sewage sludge into high-value medium chain fatty acids and methane. Wastewater treatment generates large amounts of resource-rich sewage sludge. However, the poor biodegradability of sewage sludge is a key barrier that impedes the efficient resource recovery. By advancing the underpinning science and introducing a novel technology that innovatively harnesses a human waste, the project expects to remove the barrier. Expected project outcomes will turn sewage sludge from an undesirable waste to a valuable resource. This should provide significant benefits for Australia's renewable energy and resource sectors.	60,519.50	121,464.00	119,064.00	58,119.50	0.00	0.00	359,167.00			Netherlands		
	National Interest Test Statement Australia heavily relies on fossil fuels for energy production, causing greenhouse gas emissions and air pollution. Meanwhile, Australia produces approximately 349,000 dry tonnes of sewage sludge annually, which is a large, but substantially unlocked energy resource. Energy resource recovery from sewage sludge could provide clean energy without harmful emissions, but limited efficiency currently prevents widespread adoption. The green technology developed in this project will overcome this barrier by using a human waste—urine, allowing sewage sludge from a troublesome waste to be much more efficiently converted into energy resource, while at the same time decreasing waste production. Adopted by the ubiquitous wastewater treatment facilities, the project outcomes will support the Australian water industry in achieving more sustainable management of sewage sludge, and position Australia as a leader in circular economy innovation. The project outcomes will also enable the development of commercial products by Australian start-ups and advanced manufacturing companies through new energy resource solutions. These clean products will be able to reach completely new markets, for example communities seeking independence from fossil fuel energy generation. Ultimately, this would not only create local job opportunities, but also help reduce Australia's reliance on fossil fuels, decarbonise the economy and eventually bring tangible economic and environmental benefits to all Australians.												
DP240100955 Zhu, A/Prof Tianqing	**Balance and reinforcement: privacy and fairness in high intelligence models** The aim of this project is to develop a series of privacy preservation methods to achieve a new balance between privacy and fairness in highly accurate intelligence models. The main issue in achieving this goal is that high-accuracy intelligence technologies have resulted in significant privacy violations and are very vulnerable to issues of unfairness. This project will analyse the privacy risks associated with intelligent systems and devise mechanisms to mutually reinforce both privacy and fairness based on the theoretical foundations laid by our analysis. These outcomes will	77,500.00	157,500.00	165,000.00	85,000.00	0.00	0.00	485,000.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	enable model owners to effectively protect their intellectual property and offer services to users in a private, fair, and accurate manner. **National Interest Test Statement** Data privacy is essential to organisations and individuals. Organisations spend millions of dollars keeping their data safe. However, the more secure the data, the harder it is for different systems to process it. Not only does it reduce accuracy but also data fairness which describes a system's ability to process data and make recommendations in an unbiased manner. Data accuracy and fairness are critical in today's interconnected and diverse society. This project explores new strategies to ensure that data can be exchanged securely and at a low cost. It will develop new tools and strategies to provide enhanced defence capabilities to computer systems and allow them to exchange data freely. This research project will benefit Australians in various ways. Economically, it creates a distinct competitive edge in the field of artificial intelligence (AI) and cyber security. Socially, it ensures that Australian data is secure. Commercially, it could improve decision-making in industries that rely on large amounts of data such as banking, securities, trade, and customs. To ensure the research outcomes are promoted beyond academia, we share insights via popular media and engage with industry partners and policymakers to raise awareness of the importance of privacy and fairness. The outputs of this project will enable the development of user-friendly tools industry can use to make their existing computer architectures more secure, accurate and cost-effective.												
DP240101322 Qin, Prof Lu	**Next-Generation Distributed Graph Engine for Big Graphs** This project aims to develop an efficient and scalable distributed graph engine to process big graphs. In particular, we will investigate the foundations for the distributed real-time graph engine, focusing on graph storage and graph operators, and then provide solutions for a set of representative graph mining and query processing tasks. Expected outcomes of this project include theoretical foundations and a scalable real-time graph engine to process big graphs as well as a system prototype for evaluation and to demonstrate the practical value. Success in this project should see significant benefits for many important applications such as cybersecurity, e-commerce, health and road networks. **National Interest Test Statement** Recent years have seen rapid development of technologies and collectively produced knowledge resources such as social media, online communities, mobile communications, transportation management, and finance market monitoring, to name only a few. This creates challenges, which this project will contribute to alleviating, brought about by the overwhelmingly large volume, the high velocity, and the complex structure of big dynamic graphs. The success of this project will contribute to technological advances which facilitate the better processing of big graphs. The broad spectrum of practical applications of this, and benefits to Australia, include areas such agriculture, business, cybersecurity, engineering, environment, military, public health and much more. Using cybersecurity as an example, better processing of big graphs and data will enable improved monitoring of network attacks, the detection of malware, financial frauds in e-commerce systems, and social network analysis to identify potential bad actors. Another key national benefit arising from this research project is that it will facilitate the training of researchers who will enhance the much-needed national pool of qualified professionals in this area, and position Australia for international leadership in big data analytics.	83,000.00	168,500.00	171,000.00	85,500.00	0.00	0.00	508,000.00			United States of America, Hong Kong (SAR of China)		
DP240101536 Oberst, A/Prof Sebastian M	**Unlocking the mechanisms of vibro-acoustic communication in termites** Our understanding of how termites use microvibrations to communicate is limited, as the generation, transmission and detection of these complex vibrations in substrates at the submillimetre scale are unknown. We aim to develop a fully validated vibro-acoustic termite communication model which will be used in Swårmalätørs to demonstrate their ability to synchronise and mimic collective behaviour. This will be achieved by	91,247.50	168,897.50	198,645.50	181,428.00	60,432.50	0.00	700,651.00			Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	combining novel acoustic levitation, microsystem analyses and electrophysiology to determine physical properties of termite appendages, sensory and behavioural thresholds; and by considering wave transmission characteristics in wood, friction-adhesion at the termite feet, mandible cutting and soldier alarm drumming. **National Interest Test Statement** The goal of this project is to unlock the vibro-acoustic communication mechanism in termites: how tiny vibration waves are generated and propagate through timber and how termites sense this information. To achieve this aim, we will develop novel instrumentation (acoustic levitation system and microforce plate) for non-contact determination of physical properties of the insect legs, antennae and vibration sensing organs and study of insect gait pattern in situation context. By combining these results with a electrophysiology study of sensing organs and wave propagation study in wood, we will build the world's first fully validated vibro-acoustic communication model in termite walking, feeding and alarming modes. We will use this model to demonstrate collective behaviour in termites which may lead to new insights into collective behaviour of other social insects. This will put Australia in the forefront in this scientific field. As Australia is the third largest market for termite control, after the USA and Japan, it will become a leading player in the word's pest control market by exploiting the results from this study to develop novel signals for non-chemical termite control, thereby creating jobs and increasing exports. Other economic and technological spin-offs include developing novel bio-inspired vibration sensors and micro-robots.												
DP240101548 Su, A/Prof Dawei	**Room Temperature High Energy Density Sodium-Sulfur Batteries** The project aims to boost room temperature sodium sulfur batteries (RT-NaSBs) with low cost and high energy density based on the insight understanding of "structure (atomic and electronic levels) - performance" relationship between sodium polysulfides, electrolytes, and electrocatalysts, which is a critical but rarely understood in developing a broader family of sulfur redox reaction electrocatalysts. The mechanisms discovered and electrocatalytic materials rationally designed in this project will advance knowledge in fundamental science and engineering to strengthen national research capacity. The anticipated goal of the project is bringing RT-NaSBs from lab to fab, elevating Australia's standing in Advanced Manufacturing priority. **National Interest Test Statement** As Geoscience Australia observes, Australia's solar radiation reception, at 58 petajoules per year, exceeds the total annual energy consumption by over 10,000 times. Despite this, Australia still faces significant energy challenges due to our reliance on fossil fuels and the exacerbations caused by unpredictable geopolitical conflicts. As we all know, the production of solar energy is limited by its intermittency, which is maximised by battery storage. This project addresses this problem by seeking to convert and store our abundant solar energy to chemical energy through low-cost and high energy density room temperature sodium sulfur battery systems (RT-NaSBs). The underlying focus on the 'structure-performance' relationship between sodium polysulfides, electrolytes, and electrocatalysts is a critical but little investigated question in developing a broad family of sulfur redox reaction electrocatalysts. The usual focus is on the nano-scale, however this project focuses instead on the more magnified electronic structures of this core relationship. The electrocatalysts developed in this project will advance knowledge in fundamental science and engineering, elevating our standing in Advanced Manufacturing and strengthening our national research capacity. The predicted cost-effectiveness of RT-NaSBs along with the natural abundance and non-toxicity of sodium and sulfur, has the potential to yield large-scale solar energy conversion through collaboration with industry partners.	77,500.00	153,500.00	155,000.00	79,000.00	0.00	0.00	465,000.00			New Zealand, Korea, Republic of (South)		
DP240101561 Hafalir, Prof Isa E	**Broadening Choice and Increasing Diversity in Public Schools** Currently, most families are limited to the public school in their catchment area, meaning the area in which they	38,037.00	81,021.00	96,086.00	53,102.00	0.00	0.00	268,246.00			United States of America, Turkey, Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	can afford to live. This leads to socio-economically and ethnically homogenous schools and entrenches disadvantage, as well as denying students the crucial life lessons that flow from being part of a diverse student body. This project aims to investigate a model for allocating public school places that integrates catchment areas. The expected outcome would be a system that gives families a wider choice, enabling them to enrol in out-of-area schools, while ensuring that allocations remain fair, equitable and balanced, and also delivering benefits such as achieving a desired level of diversity in student populations within schools												
	National Interest Test Statement The quality of a successful public education system not only relies on good academic results, but also on learning life lessons, such as interacting with a diverse student cohort. However, public schools in Australia are often restricted to 'catchment areas.' As a result, school compositions typically mirror neighbourhood compositions, contributing to location-based segregation and depriving students of such diversity. This project will develop a model of fair allocation of public school places that integrates catchment areas, and its outcomes will directly address UNICEF findings which currently place Australia in the bottom third of OECD countries for equitable access to quality education. Adoption by the Departments of Education of various states will result in a more equitable system that gives families a wider choice, for example, by enabling them to enrol in out-of-area schools. Such a system will lead to more diverse student populations in public schools, resulting in more tolerant and open-minded young citizens to positively contribute to Australia's economic, social and cultural life. We will promote research outcomes beyond academia for the adoption of research, for instance, via a 2-day workshop in year 3 of the project on school choice. This workshop will bring together academics, policy-makers in government and practitioners in the K-12 education sector.												
DP240101955 Crosby, A/Prof Alexandra L	**Surfacing urban wetlands in two urban renewal sites in Sydney** Urban wetlands in Australia provide benefits for climate change mitigation, pollution reduction, habitat provision and socioecological connection. However, in large cities like Sydney, urban wetlands are unseen because undergrounded, and, therefore not adequately understood. This illegibility, and loss of understanding by residents, planners and policy makers impedes wetlands' good management. This project surfaces wetlands through visualisation in a multimodal knowledge platform focusing on two urban renewal sites, Green Square and Marrickville South. We leverage design ethnography to develop resources for strengthening multiple stakeholders' socioecological engagement through methods empowering just, creative and open participation.	66,127.00	138,454.00	142,736.50	70,409.50	0.00	0.00	417,727.00			United States of America, England, Canada		
	National Interest Test Statement Australia's urban wetlands are environmental assets that contribute significantly to flood control, water pollution, microclimates that help mitigate extreme weather conditions, support for biodiversity, and socioecological engagement. With more than 85% of Australians living in urban areas and unprecedented urban growth, wetlands' environments and histories are increasingly rendered invisible and illegible. Creating effective means to address the visibility of these environments is particularly urgent as new precincts are planned on undergrounded wetlands. The research will generate new knowledge and visualise Sydney wetlands' stories in two urban renewal precincts through an online knowledge platform, an exhibition and a program of event in partnership with local organisations. This project will benefit Australian society and environment by designing a framework that can be adapted and translated to different localities to enhance residents, local governments, planners, and developers' understanding of the history and value of urban wetlands, to strengthen local socioecological connections and mobilise forms of care in the face of rapid environmental change.												

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DP240102050 Cao, Prof Longbing	**Data Complexity and Uncertainty-Resilient Deep Variational Learning** Enterprise data present increasingly significant characteristics and complexities, such as multi-aspect, heterogeneous and hierarchical features and interactions, and evolving dependencies and multi-distributions. They continue to significantly challenge the state-of-the-art probabilistic and neural learning systems with limited to insufficient capabilities and capacity. This research aims to develop a theory of flexible deep variational learning transforming new deep probabilistic models with flexible variational neural mechanisms for analytically explainable, complexity-resilient analytics of real-life data. The outcomes are expected to fill important knowledge gaps and lift critical innovation competencies in wide domains.	70,565.00	145,630.00	155,630.00	80,565.00	0.00	0.00	452,390.00			Portugal		
	National Interest Test Statement In the era of big data, digital innovation for small-to-large enterprises increasingly relies on understanding data complexities. This in turn increases the necessity for automated scalable analytics to address non-conventionally solvable problems in existing learning systems and vendor solutions. This research aims to develop foundational, systematic, deep variational learning theories and models for analytically explainable, complexity-resilient enterprise analytics. The outcomes are expected to fill important knowledge gaps in AI and data science and to lift innovation competencies in wide domains, which is currently not possible using existing knowledge and vendor solutions. The research addresses multiple national science and research priorities, including health, transport, cybersecurity, and environmental change, involving increasing data complexities and challenges, and requiring data-driven discovery. The deliverables will potentially enable profound intellectual, socioeconomic, and commercial benefits, applicable to any enterprises for transforming their analytics capability/capacity, productivity lift, and evidence-based transformation and decision-making. The translation pathways include communicating the significant results to industry and government end users through workshops, training, and future consulting and linkage engagement with small-to-large enterprises.												
DP240102176 Wang, Prof Guoxiu	**All-Solid-state Sodium-ion Batteries for Renewable Energy Industry** Sodium-ion batteries have been widely recognised as scalable and sustainable system for renewable energy storage and conversion owing to abundant resource of sodium and low cost. However, the electrochemical performance and safety of this technology must be improved for practical deployment. This project aims to rationally design and synthesise solid-state polymer electrolytes with high sodium ion conductivity and high sodium ion transfer number. The expected outcome of the project is to manufacture all-solid-state sodium-ion batteries for renewable energy industry in Australia. The project will support the transition of energy supply to renewables, and therefore attain a secure and reliable zero-carbon emission energy future.	89,040.50	187,298.50	198,271.00	100,013.00	0.00	0.00	574,623.00			Spain		
	National Interest Test Statement Australia’s government’s goal for fighting against climate change is to realise net-zero emissions by 2050. To achieve this target, the energy industry sector must dramatically reduce burning fossil fuels for energy generation and transit to harness renewable energy. Sustainable and grid-scale energy storage technologies play a pivot role on the transition of the Australian energy industry to renewables. This project is expected to deliver a sustainable and low-cost all solid-state sodium-ion battery technology that can safely store energy at the scale needed for Australia’s household and electricity grid. In particular, this project will solve a safety problem in the												

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	practical operation of sodium-ion batteries by replacing a flammable liquid electrolyte with all-solid-state polymer electrolytes. All-solid-state sodium-ion batteries have many advantages for energy storage over commercial lithium-ion batteries including low cost, abundant resource of sodium, and high-level operation safety. The research outcomes of this project will create innovations and cutting-edge battery technologies, which could be commercialised. Thus, this project research could also generate job opportunities in the manufacturing industry.												
DP240102349 Chen, Prof Ling	**Toward Human-guided Safe Reinforcement Learning in the Real World** This project aims to investigate human-guided safe reinforcement learning (RL). Safe RL is an important topic that could enable real applications of RL systems by addressing safety constraints. Existing safe RL assumes the availability of specified safety constraints in mathematical or logical forms. This project proposes to study learning safety objectives from information provided directly by humans or indirectly via language models, and human-guided continuous correction for safety improvements. The established theories and developed algorithms will advance frontier technologies in AI and contribute to a wide range of real applications of safe RL, such as robotics and autonomous driving, bringing enormous social and economic benefits.	89,594.00	181,840.00	187,454.00	95,208.00	0.00	0.00	554,096.00					
	National Interest Test Statement Reinforcement Learning (RL) has shown great potential in scenarios that require learning through interaction with the environment, such as robotics and dialogue systems. However, without adequately addressing safety and security, RL systems might not only result in the loss of human well-being or lives, but also pose huge threats to business entities, government departments, and even national security. Existing safe RL is far from being suitable for real-world applications; it assumes the availability of predefined safety constraints in mathematical or logical forms, which is often not the case in real applications. This project will develop innovative algorithms to bring human-guided learning to safe RL, thus overcoming practical challenges for real-world applications. Apart from creating new knowledge and promoting the outcomes of the project in academia, we envisage holding public seminars and industry workshops to disseminate the findings to respective end-users and communities, thereby maximizing the understanding and adoption of the research. It is anticipated that outcomes of this project will generate commercial, economic, and social benefits to multiple industry sectors in Australia, enabling real-world RL systems such as safe autonomous driving, AI-assisted medical surgeries, and ethical dialogue systems. The project's high-quality training opportunities will further enhance Australia's research capacity in Artificial Intelligence.												
DP240102646 Lu, Prof Dylan D	**Extending Remaining Useful Life of Second-life Battery Energy Systems** The project aims to develop a framework to reuse second-life battery packs with different degradation levels. This includes a novel machine learning and online battery state estimation algorithm that does not require past use case historical data of the SLBs, an advanced control algorithm to balance the energy in each battery pack and an optimized modular inverter architecture with integrated voltage boosting capability to manage the batteries and meet the control objectives. This benefits not only the environment through delayed e-waste or recycling cycles but also helps the Australian manufacturing sector through a circular economy of energy products and services.	100,138.00	201,487.00	200,594.50	99,245.50	0.00	0.00	601,465.00			Spain, Denmark, Singapore		
	National Interest Test Statement												

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	The mass deployment of battery energy storage could ensure the reliability and security of the power network, but ensuring their health to prevent failure and mitigate potential hazardous situations is extremely important. This research investigates ways of optimising battery module capacity whilst improving the remaining useful life of second-life batteries. The project's intended outcome is a cost-effective, modular, more reliable system for current and future three-phase power systems, that enhances national energy security when coordinated appropriately with renewable energy. In addition, the innovations and capabilities enabled by this project, will be widely disseminated (including to industry, where commercial opportunities can be explored), and will position Australia for global leadership with industry opportunities and solutions for cleaner, more reliable and affordable battery systems.												
DP240102971 Tipper, Prof Joanne L	**A novel precision-engineered microfluidic chip for wear particle research** This project aims to develop 1- novel protocols to generate clinically-relevant wear particles from spinal implants in-vitro and 2- a technological framework for the fabrication of a novel microfluidic 3D spinal implant-on-a-chip with tailored mechanical, material and biological properties. This will provide a cost-effective tool, currently unavailable, that allows investigation into the impact of wear particles on healthy spinal disc cells. We expect our technological framework to become an invaluable tool for biomedical engineers, biologists, and bio-engineers to work together and generate clinically relevant in-vitro data that supports optimisation for spinal implant design, fabrication, and safety.	88,754.00	182,467.50	190,204.00	96,490.50	0.00	0.00	557,916.00			United States of America, England		
	National Interest Test Statement Intervertebral disc (IVD) provides crucial cushioning between vertebrae and absorbs pressure put on the spine. IVD damage, a common consequence of ageing and injuries, is the main source of back problems that often leads to spinal joint replacement. Because spinal implants are exposed to high load and a great range of motion, they generate large numbers of wear particles, causing inflammation and pain. While there are major concerns that wear particles may damage adjacent healthy IVDs, a strategy to fully understand their impact on healthy IVD biology is currently lacking. Significant research seeking to address this challenge has long been hindered by (1) the absence of a reliable IVD platform that mimics the complex biology of natural IVD and (2) a lack of protocol to generate spinal wear particles in laboratory settings. This project aims to address these gaps, developing protocols to generate wear particles in the lab, create the world-first reproducible and adaptable 3D on-chip IVD spinal implant model and understand the impact of wear particles on healthy IVD cells. This technological framework provides a controlled and monitorable environment for performing a range of IVD lab experiments at a significantly low cost and significantly improve the physiological relevance of experimental data. The outcomes are expected to create new market opportunities for Australian advanced manufacturing firms via optimisation of implant design, fabrication, and safety.												
DP240103127 Toth, Prof Milos	**Indistinguishable Quantum Emitters in van der Waals Materials** Solid state sources of single photons ("quantum emitters") are a key building block for implementation of scalable quantum technologies. Amongst many potential platforms studied, impurities in hexagonal boron nitride (hBN) are at the forefront due to their brightness and ease of manufacturing. However, their main disadvantage is spectral instability which prohibits engineering of practical devices. The current project will address this bottleneck and deliver an optically stable solid state quantum light source in hBN. The project will produce a robust hardware toolkit for quantum technologies. It will provide excellent training for young Australians and generate key intellectual property for quantum startups and the quantum industry.	92,208.00	198,719.50	210,911.00	104,399.50	0.00	0.00	606,238.00			Germany, United States of America		

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	National Interest Test Statement The global quantum industry has been estimated conservatively to reach $86 billion by 2040 in the CSIRO report "Growing Australia's Quantum Technology Industry". The report estimates that Australia can realise a global revenue of at least $4 billion and create over 16,000 jobs in this sector. It emphasizes the need to attract, train and retain talent, and address gaps in industry capabilities. This project addresses a technological bottleneck in advanced manufacturing of single photon sources - hardware for quantum communications, quantum sensing and quantum computation. The objective is to improve the performance metrics of these sources to the level needed for real-world applications in alignment with the CSIRO report recommendations. In addition, the project will create content for quantum and technology degrees to train students and young researchers. The outcomes of the project will benefit Australian labour market by building high-tech workforce for the quantum industry for positioning Australia in the lead of the emerging quantum economy. The general public will learn about the advances of the project through the Sydney Quantum Academy, the Centre of Excellence for Transformative Meta-Optical Systems and major press and social media channels.												
	University of Technology Sydney	1,229,008.00	2,498,423.00	2,615,187.00	1,406,204.50	60,432.50	0.00	7,809,255.00					
University of Wollongong													
DP240100017 Susilo, Prof Willy	**Bridging the gap between Key-Evolving Signatures and Their Applications** This project aims to address the gap between cryptography primitives and their applications. Key-evolution signatures are effective in resolving secret key compromises. Theoretically, they can be adopted to secure Proof-of-Stake in blockchain against long-range attacks. Unfortunately, there are many remaining issues to address that make adoption insecure. This project is significant since it will enrich theoretical cryptography contributions and ensure their practical and secure applications. The expected outcomes are innovative technologies, guaranteeing security whilst solving real-life problems. The project will deliver significant and innovative technology for enabling effective and secure blockchain systems.	78,863.00	165,917.00	180,150.00	93,096.00	0.00	0.00	518,026.00					
	National Interest Test Statement Proof-of-Stake (PoS) consensus algorithm is a promising candidate that eventually can replace the commonly used Proof-of-Work (PoW) algorithm in blockchain applications to solve existing vast energy consumption issues. Unfortunately, PoS suffers from the well-known long-range attack, which is very challenging. This project aims to develop innovative techniques to construct cryptographic primitives to solve security concerns in PoS blockchain applications. The outcomes of this project will directly lead to more practical and secure blockchain platforms to boost blockchain adoption in Australia, which aligns with lists of critical technologies in the national interest and the landscape described in the National Blockchain Roadmap proposed by the Australian Government. The expected outcomes of this project include new techniques that enhance cryptographic algorithms to solve practical problems and their adoption to secure blockchain applications. This will provide direct benefits to lower costs and contribute to a more innovative economy, which will benefit Australian and international communities. This project also offers a significant capacity-building opportunity to place Australia in a position to lead developments in blockchain technology. A clear project plan and the solid experiences of CIs will facilitate the success of this project. We will also communicate the research results to the industry to seek opportunities to collaborate and commercialise the results.												
DP240100456 Ainsworth, A/Prof Andrew	**Reaching for tax breaks: Household financial decisions and tax policy** The project aims to investigate how two tax incentives – franking credits and negative gearing of investments – impact individual taxpayer risk-taking behaviour, voluntary savings and retirement outcomes. The project will develop a new measure of tax efficiency based on if,	35,699.00	74,160.00	76,922.00	38,461.00	0.00	0.00	225,242.00					

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	and how, individuals take advantage of franking credits and negative gearing. It will identify what factors drive the use of franking credits and negative gearing and whether their use is associated with better retirement outcomes. The findings of the project will potentially lead to an improvement in individuals' financial literacy, retirement outcomes and reduce reliance on the aged pension. **National Interest Test Statement** The project investigates how two income tax incentives available to individuals in Australia – negative gearing of investments and franking credits – influence the risk-taking behaviour, and retirement outcomes, of individuals in Australia. The research will assess what type of individuals use these tax incentives and whether their use is concentrated among certain groups of tax payers. A vital question this research will address is whether the use of negative gearing and franking credits by individuals leads to less reliance on the aged pension when individuals retire. The research will have considerable economic benefits as it will assess whether these tax incentives are improving voluntary savings in Australia and helping individuals be better prepared for retirement. Any potential inequity related to these two tax incentives will be identified. The findings have the potential to influence public policy and will be shared with Federal Government organisations, such as Federal Treasury and the Australian Tax Office. The findings are of interest to every Australian individual, and it is anticipated that the mainstream media will be able to assist in disseminating our results to a broad audience.												
DP240100920 Kaye, Prof Stuart B	**Law And Policy Framework For Remote Sensing In Maritime Enforcement** This project aims to address a gap in national and international law relating to the use of modern technology in fisheries enforcement. It will advance the fight against illegal fishing by developing model legal frameworks to underpin the use of remotely sourced data in fisheries surveillance and enforcement. Expected outcomes include enabling Pacific Island Countries to rely on remotely sourced data to combat illegal fishing, conduct enforcement operations and prosecute fisheries offences. This should provide significant benefits, such as reducing the cost of fisheries enforcement, increasing the tools available to combat illegal fishing, and enhancing the capacity of Pacific Island Countries to protect their fisheries and maritime zones.	44,674.00	90,944.00	97,928.00	51,658.00	0.00	0.00	285,204.00			Solomon Islands, Cook Islands, Fiji, Micronesia, Federated States of, Palau, Papua New Guinea, Tonga, Kiribati, Tuvalu, Nauru, Samoa, Tokelau, Niue, New Zealand, Marshall Islands, Vanuatu		
	National Interest Test Statement This project is about improving maritime enforcement in the Pacific. It seeks to optimise national laws and policies for the conduct of fisheries surveillance and enforcement by providing for the use of information derived from modern technology, including remote sensing and satellite monitoring—something which is not currently addressed in national, regional and international frameworks. The project will provide a template for reform, allowing prosecution of vessels engaged in illegal fishing based upon electronic evidence. Illegal fishing represents an existential challenge for many Pacific Island Countries, whose economies are highly dependent upon revenues from fisheries in their vast maritime zones. The project will produce clear pathways for these countries to address the challenges inherent in protecting their fisheries and maximise their ability to respond effectively, using modern technologies. Australia has a substantial interest in the economic well-being and stability of the Pacific Island Countries and is a strong supporter of the rules-based maritime order and the law of the sea, as evidenced in the Foreign Affairs White Paper, so the project will assist to achieve this objective. The results of the project will be of broad interest. They will be presented directly to Pacific Island Governments and the Forum Fisheries Agency, as well as through publications and presentations available to regional organisations, civil society, courts and tribunals.												
DP240101050	**Magnetorheological Elastomer Based Tuned Mass Damper**	80,542.00	165,360.50	174,179.00	89,360.50	0.00	0.00	509,442.00			Hong Kong (SAR of		

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Li, Prof Weihua	This project aims to protect buildings utilising an advanced tuned mass damper (TMD) which has characteristics of adaptability, is energy and sensor free and has negative stiffness via the integration of magnetorheological elastomers, a self-sensing self-powered element and negative stiffness technologies. This project expects to theoretically and experimentally study the performance of the TMD on structural protection from wind loads and earthquakes. The expected outcomes of this project will advance TMD practice and structural protection technology, and benefit the building protection industry, both domestically and globally. This will provide significant benefits to the working efficiency and safety of building occupants.										China)		
	National Interest Test Statement Earthquake-induced vibration poses a great threat to building and occupants' safety in Australia. The building vibration caused by huge wind also induces motion sickness in the occupants and decreases their working efficiency, thus leading to a financial loss for Australian companies. This project aims to protect buildings utilising an advanced device called a tuned mass damper (TMD) that can reduce building vibration. This device will have advanced engineering features in terms of performance, functionality, and energy saving. It will also be resistant to power outages to account for a wide range of scenarios that cause building vibration. This research will fill the knowledge gap in building vibration protection via cutting-edge technologies. The success of this project will provide a reliable and sustainable solution that will enable the Australian industry to develop high-standard TMD systems for structural control, thereby benefiting Australian civil and manufacturing industries, increasing Australian building safety and reducing the financial loss of Australian companies caused by building vibrations. With excellent vibration reduction performance, the proposed tuned mass damper can easily be retrofitted to buildings. The investigators will actively liaise with industrial collaborators to commercialise the proposed tuned mass damper and apply this advanced technology in practical applications.												
DP240101192 Wang, A/Prof Caiyun	**Asymmetric Biomembranes for Blue Energy Harvesting** This project aims to develop a new class of biomembranes for efficient ion-selective transport, to address the challenge of low power density facing the realisation of blue energy harvesting. This will be achieved using innovative chemistries guided by theoretical modelling to endow membranes with unique features: heterogeneities in surface charge and pore structure. Expected outcomes include a new concept for membrane design, advancement of knowledge in energy conversion, creation of a new prototype power device without need of any external forces, and significant advances in self-powered wearable electronics potentially revolutionizing industries such as healthcare and entertainment.	91,176.50	185,360.00	186,229.00	92,045.50	0.00	0.00	554,811.00			Taiwan, Japan		
	National Interest Test Statement The application of wearable electronics has expanded significantly in recent years to various industries, such as health and wellness, smart home, virtual and augmented reality, and workplace safety. Critical to the development of these electronics is the need for safe and disposable power sources, and this remains a paramount challenge. This project will provide a solution to this type of power source which is in critical need. This will be achieved by developing innovative membranes based on naturally-sourced materials to drive forward the development of blue energy harvesting, an energy captured through a naturally occurring osmotic process. Compared to commonly used batteries, this power has the advantages of no disruptive electrochemical reactions with no harmful byproducts. This project relies on new methodologies to generate fundamental knowledge, innovative membrane materials and prototype devices. It will provide cost-effective synthetic methods and membrane design concepts. This will be key in enhancing Australia’s international competitiveness in the emerging												

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	areas of blue energy harvesting and wearable power sources. This project will have a profound impact on Australia's renewable energy harvesting and advanced manufacturing, as well as other membrane-based technologies and industries, with enormous social and economic benefits.												
DP240101345 Dosseto, Prof Anthony	**Middle Age Earth: ocean chemistry and evolution in the Boring Billion** This project aims to investigate the role of ocean chemistry on the evolution of eukaryotes during the "Boring Billion" (1800-800 million years ago) and how sedimentary rocks record past ocean chemistry, by using innovative geochemical proxies. This project expects to generate new knowledge in geochemistry, sedimentology and paaleo-biology using interdisciplinary approaches. Expected outcomes include a quantitative understanding of the formation of sedimentary rocks, and of the links between evolution and marine nutrient and metal abundance. This should provide significant benefits, such as understanding the formation and alteration of ore-bearing sedimentary rocks and how life has evolved during Earth's Middle Age.	107,916.50	188,478.50	133,741.00	53,179.00	0.00	0.00	483,315.00			Canada		
	National Interest Test Statement This project will address a significant knowledge gap of our understanding of how changes in ocean chemistry shaped life during a period of Earth's history commonly proposed as having stalled evolution. To achieve this goal, the project will produce new methods to assess how sedimentary rocks can be used to reliably estimate past ocean chemistry, and compare robust geochemical records with new fossil and biomarker records. These outcomes will benefit Australians: (i) Economically. The study period is key to the formation of numerous ore deposits in sedimentary rocks in Australia and this project will provide tools to better understand the formation of these rocks; (ii) Environmentally. The project will inform on how environmental changes shape life; (iii) Socially. We will be training the next generation of scientists to cutting-edge research and innovative tools.												
DP240101399 Spenkelink, Dr Lisanne M	**High-throughput single-molecule directed evolution** DNA polymerases are essential enzymes in many biotechnological tools, including DNA sequencing and PCR tests. However, existing DNA polymerases have limitations, resulting in inaccuracies and inefficiencies. Existing methods to improve polymerases lack sensitivity to screen for subtle, yet pivotal traits. This project aims to overcome this limitation by developing a new single-molecule directed-evolution system to evolve better polymerases. With this new technology we aim to identify DNA polymerases with improved performance that benefit biotechnological applications. Additionally, these single-molecule directed-evolution methods will benefit the wider scientific community and lay the foundation for further advances in directed evolution.	93,466.50	197,228.50	205,902.00	102,140.00	0.00	0.00	598,737.00			France		
	National Interest Test Statement DNA polymerases are protein machines that copy DNA. These polymerases are essential in many biotechnological applications, including PCR tests and DNA sequencing. However, existing DNA polymerases have limitations that can result in inaccuracies and inefficiencies. Current methods to develop better DNA polymerases are limited in their ability to enhance specific traits. This project aims to overcome this limitation by developing a new, high-throughput directed-evolution system. This new single-molecule directed-evolution tool will allow the design of new polymerases for bioindustry applications, such as rapid diagnostics to facilitate early recognition and treatment of infectious diseases. Furthermore, novel biomolecules generated using our new method can be used to enhance food production in Australia and overseas by enabling safe and efficient genome												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	improvements. The knowledge from this project will impact the biotechnological and pharmaceutical industry in Australia by increasing our general understanding of how DNA polymerases copy DNA. Additionally, this increased understanding will contribute to the training of highly skilled scientists in Australia and contribute to a higher-quality workforce, thereby future proofing australia's biotechnological and pharmaceutical industries.												
DP240102511 Dottori, Prof Mirella	**Touch and Tension: Molecular Determinants of Human Mechanosensation** Feelings of touch and muscle tension are initiated by mechanosensory neurons found within the peripheral nervous system. Knowledge of human mechanosensory neurons has predominantly relied on rodent studies because of the limited availability of human tissue, which is not ideal. Our team has developed novel technologies for generating human mechanosensory neurons 'in the dish'. The major aim of this project is to use human stem cell-derived mechanosensory neurons as a platform to extensively study their molecular and functional properties. The significant benefits are the advancement of knowledge in the human mechanosensory system, which to date has been lacking, and in the long-term progress commercial development of novel drugs.	180,996.50	339,153.50	217,519.50	59,362.50	0.00	0.00	797,032.00			Germany		
	National Interest Test Statement This project is aimed at discovering new knowledge about the human mechanosensory nervous system, which plays a fundamental role in sensing tactile stimuli (such as touch and vibration) and muscle movements in the body. The current gap in knowledge of our understanding of the biology mediating mechanosensation in humans has greatly hampered the identification of pharmacological targets that can modulate mechanosensory function in the body. This is critically needed as loss of mechanosensory function is strongly associated with aging poorly and a vast number of disease conditions, including diabetes, cancers and neurological disorders, all of which negatively impact Australian society and economy including the costs of care. The knowledge and discoveries gained through this project will in the long term translate to the commercial development of novel drugs that modulate specific sensory functions in humans, thereby benefiting the health and well-being of society and positively contributing to the economy.												
DP240102926 Wang, Dr Nana	**Electrolyte and interface engineering of solid-state sodium batteries** This project aims to develop large-scale solid-state sodium-ion batteries exhibiting better safety compared to classic liquid electrolyte batteries without compromising on performance, thus addressing the significant issue of safety in batteries. This will be achieved by novel engineering of solid-state electrolytes and electrolyte-electrode interfacing by a fundamental understanding of sodium-ion transport using statistical and machine-learning techniques. Expected outcomes include an understanding of ion-transport mechanisms in batteries, delivery of advanced solid-state electrolytes with high ionic conductivity, and batteries with excellent performance and safety characteristics, which benefits Australia's environment and sustainability.	70,992.00	143,334.00	145,784.00	73,442.00	0.00	0.00	433,552.00			Korea, Republic of (South), China (excludes SARs and Taiwan)		
	National Interest Test Statement This project aims to develop large-scale, cost-effective, high safety, and high-performance solid-state sodium-ion batteries by electrolytes and interface engineering. Expected outcomes include constructing solid-state electrolytes with high ionic conductivity, designing intimate electrolyte/electrode interfaces, and obtaining safer batteries. This will address safety issues faced by batteries based on organic electrolytes which are volatile and												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	flammable, causing issues like burning or explosion. Solid-state sodium-ion batteries have the advantages of intrinsically high safety, good thermal stability, and low cost, especially for large-scale energy storage systems. The outcomes of this project will accelerate Australian energy storage markets to realize the full value and benefits. Besides, this project will have fundamental significance in material science, physical chemistry, nanotechnology, electrochemistry, as well as strengthen national research capacity in energy materials. This project will make Australia the world's batteries leader in terms of battery production and put Australia at the forefront of the utilization of renewable and clean energies.												
DP240102945 Tieu, Prof Kiet A	**Environmentally friendly lubricants for higher productivity in cold rolling** This project aims to develop an oil free aqueous lubricant for cold rolling to replace the existing oil-in-water emulsion. The lubricant will be molecularly engineered to combine synergy between nanomechanics and tribochemistry of boundary additives to deliver integrated functionalities in the strip rolling. During cold rolling , lubricant starvation often occurs at high speed and it has restricted the productivity of the rolling mill and affected the strip gauge and surface quality. Expected outcomes of this project include an innovative oil free lubricant with significant environmental benefits and an ability for manufacturers to improve productivity by operating at higher speeds, lower costs, and achieve superior strip surface quality.	99,962.00	205,678.00	215,974.00	110,258.00	0.00	0.00	631,872.00					
	National Interest Test Statement The widely used oil-in-water emulsion as a rolling lubricant still have many drawbacks such as restricted productivity due to lubrication starvation and vibration at high speeds, high cost, strip cleanliness issues, and environmental concerns from oil pollution. The project aims to overcome the restrictive speeds for cold rolling of metals by developing an oil free lubricant which not only can fulfil all technical requirements on the rolling surfaces for a higher rolling speed to boost productivity, but also offer a low-cost production, easy storage , environmental friendliness and replace oil which is a dwindling resource. The advanced testing//characterisation program combined with a sophisticated molecular modelling will unlock the mechanism for the lubricant excellent performance in friction and wear. The lubricant package can thus be easily optimised and translated to automobile engines , metalworking fluid or high-speed bearings. The lubricant can offer targeted delivery and active release of anti-wear additives to the confined contact areas which traditional additives are not capable of. The project will provide long-term benefits to the Australian manufacturing industry (even beyond the steel and aluminium). The ability of metal manufacturers to produce quality products at a reduced cost will bolster their domestic and global competitiveness.												
	University of Wollongong	884,288.00	1,755,614.00	1,634,328.50	763,002.50	0.00	0.00	5,037,233.00					
Western Sydney University													
DP240101695 Robinson, Prof Kerry H	**Gender Affirmation in Childhood: Protective Factors and Strategies** This interdisciplinary study aims to explore Australian Trans and Gender Diverse (TGD) children's experiences of affirming their gender. It is innovative methodologically for inclusion of arts-based methods with children, and multiple perspectives from TGD children (5-16), peer allies, parents, healthcare professionals and educators. TGD young people are a rapidly growing population, disproportionately affected by intentional self-harm and suicidality. The project	49,423.50	117,354.00	130,925.50	62,995.00	0.00	0.00	360,698.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	expects to generate new understandings of gender, the lived experiences of TGD children and families, and protective factors in their lives. Significant benefits should be informing theory, policy, and early interventions and co-development of resources for key stakeholders. **National Interest Test Statement** Trans and gender diverse young people are a growing population nationally and internationally, with referrals of children to a gender clinic increasing by 200 per cent since 2003 at one Australian children's hospital. These children are vulnerable to marginalisation and discrimination and are at higher risk of self-harm and suicidality. This project will examine children's, parents'/carers' and other key stakeholders' understandings of gender, experiences of children's social and medical gender affirmation, family supports, and experiences and needs of key service providers: health care professionals and educators. This project will also identify protective factors and strategies to minimise distress for trans and gender diverse children and their families. Outcomes include evidence-based resources to enable more tailored and supportive service provision and practices with early interventions to enhance wellbeing. These outcomes will inform policies and practices across health, education, and other children's and family support sectors via the project's stakeholder advisory board networks and collaborations with the Western Sydney University Translational Health Research Institute, government, and community organisations. Culturally safe service provision for trans and gender diverse young people and families improves their health, wellbeing and quality of life, enabling better and richer participation in the Australian community and providing social and health benefits.											
DP240102490 Welbergen, Prof Justin A	**Vocal mimicry in songbirds** Many of the world's largest clade of birds - the songbirds - incorporate vocal mimicry in their songs, but while scientific interest in vocal mimicry dates from Aristotle, limited progress has been made. With our unique research program we aim to provide an empirically based, theoretically informed understanding of avian vocal mimicry. In an important advance, we will examine both sexes to test long-held male-centric assumptions about evolutionary origins and maintenance of this trait. Crucially, we focus on lineages found only in Australia and PNG, where songbirds originated, to develop a robust scientific understanding of vocal mimicry across the entire songbird clade, and so provide an important new perspective on why and how song began. **National Interest Test Statement** Our project aims to solve a problem that has puzzled biologists for millennia: why do many songbirds mimic the sounds produced by humans and other animals? We will address this problem by combining field-based studies of representative vocal mimics from old Australian songbird linages with cutting-edge desktop analyses of evolutionary patterns of vocal mimicry among songbirds globally. In leveraging Australia's unique position as the home of the world's first songbirds, our project promises to break new ground in our scientific understanding of why and how songbirds evolved their extraordinary vocal abilities. By examining vocal mimicry in both female and male Australian birds, this understanding will be emancipated from northern-hemisphere research biases that historically have favoured male-centric investigations on birdsong. Expected outcomes include valuable acoustic and ecological data on unique but understudied Australian endemics of importance for conservation and management, and our extensive acoustic recordings will be publicly archived to provide an important record of our natural heritage long-term. Avian vocal mimics are culturally important, as well as being charismatic, and we will work with documentary makers, artists and educators to ensure our research enriches the lives of Australians from diverse sectors of the community.	82,765.00	160,772.00	159,924.00	81,917.00	0.00	0.00	485,378.00			United States of America, England		
	Western Sydney University	132,188.50	278,126.00	290,849.50	144,912.00	0.00	0.00	846,076.00					
	New South Wales	9,976,510.00	20,419,284.50	20,182,989.50	10,335,662.50	852,237.00	256,789.50	62,023,473.00					

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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Northern Territory													
Charles Darwin University													
DP240102733 Zander, A/Prof Kerstin K	**The demographic consequences of extreme weather events in Australia** This project aims to understand how extreme weather events are likely to affect Australians' residential mobility choices, using machine learning techniques to provide the first overview of the impact of natural hazards on where Australians are likely to live in the future. Expected outcomes include an understanding of the influence of extreme weather events on changes in population numbers and composition. Expected benefits include an understanding of how environmental drivers are influencing internal migration in Australia, enabling better planning for service provision and economic growth. **National Interest Test Statement** The cost of extreme weather events in Australia is forecast to double to $39 billion per year by 2050. These events have long-lasting social and economic impacts on individuals and communities. About 9 million Australians have been impacted over the last 30 years, some more than once. People are displaced from their homes, temporarily or permanently. In the future some locations might become uninhabitable and too risky to live. This is likely to lead to changes in the country's spatial and compositional demography and economy. The process and types of mobility decisions being made are not currently well understood: where people move to and for how long; who moves and who stays? This project will mine hazard and population data, including the most recent census, to assess the impact of extreme weather events on migration patterns and resulting demographic change. This will provide crucial information for essential service provision, infrastructure planning, disaster management and strengthening community resilience. This will enable Australia to manage environmental change by ensuring resilient urban, rural and regional infrastructure.	62,000.00	125,500.00	113,500.00	50,000.00	0.00	0.00	351,000.00			Germany, England		
	Charles Darwin University	62,000.00	125,500.00	113,500.00	50,000.00	0.00	0.00	351,000.00					
	Northern Territory	62,000.00	125,500.00	113,500.00	50,000.00	0.00	0.00	351,000.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Queensland													
Griffith University													
DP240100269 Hamilton, Prof David P	**A paradigm shift for predictions of freshwater harmful cyanobacteria blooms** This project aims to advance model predictions to generate novel insights into the triggers of freshwater harmful cyanobacteria blooms. Current models are poorly adapted for this purpose because they fail to account for antecedent environmental forcing. The project is expected to create new knowledge of cyanobacteria dynamics from simulating the adaptive responses of individual cyanobacteria cells, colonies or filaments to temperature, light and nutrient history. Three field studies will be used to validate a new individual based model. The outcomes of this project will be valuable for managing freshwater ecosystems that are increasingly subject to blooms in a warming climate, and for testing suitable mitigation and control strategies.	114,917.00	266,114.50	223,550.50	72,353.00	0.00	0.00	676,935.00			Germany, China (excludes SARs and Taiwan)		
	National Interest Test Statement Harmful cyanobacteria (blue-green algae) blooms are aggregations of photosynthetic bacteria, some toxic, that impact water quality and treatment, recreation, and economic returns from water. In Australia, measures to combat blooms and treat drinking water cost tens of millions of dollars each year. Indirect costs also result in loss of opportunity, biodiversity and ecosystem services. Environmental change and extreme weather events associated with global warming are increasing occurrences of blooms. The current generation of predictive models does not include the variety of species and strains causing the blooms and their adaptive responses to key environmental stimuli like water temperature, nutrients and light. This project will provide a new generation of model that is 'fit for purpose' and targeted at species and strain level, including physiological responses. More accurate predictions of blooms will provide benefits for water security and water quality, increasing knowledge of the antecedent conditions that trigger blooms and providing a model tailored to test management strategies. Our connectedness with cyanobacteria research leaders globally, and the water industry and policy makers in Australia, will maximise the usefulness, relevance and translation of the model for management outcomes. The project aligns with the National Water Reform Agenda goals to have a coordinated, strategic and trusted scientific approach to tackle water challenges in Australia.												
DP240100680 Bennett, Prof Andrew	**Cultivating digital music making in regional Australia** The project aims to examine effective methods of aligning local infrastructure and online resources to support digital music creators and their communities in regional Australia. It will promote digital creative industries and augment existing investments in regional art institutions and digital fabrication infrastructure. The project collaborates with regional digital artists to share their skills and expertise, with the goal of improving coordination of resources and infrastructure for the growth of regional digital creatives and engagement with their communities. Knowledge outcomes will assist governments in optimising the delivery of creative services and resources in regional Australia.	45,381.50	96,576.00	97,044.00	45,849.50	0.00	0.00	284,851.00					
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Developing digital creative practices in regional Australia is important for driving innovation and community wellbeing in the 21st century. Yet these vital outcomes rely on the effective utilisation of regional infrastructure and online networks which currently are not well utilised by digital artists. This project will produce new knowledge about how material and social resources in regional areas are best coordinated to develop and diversify technology-based creative arts practices, in particular digital music makers who bridge creative arts and digital technologies. The project fills gaps in our understanding about productive connections between physical and online infrastructure for supporting digital workers in the creative industries. The project will provide the evidence base needed to build the capacities of policy makers and citizens about ways creative pursuits can be expanded through better utilisation of available resources. This knowledge will be useful for practitioners, local councils, regional development bodies, and regional arts funders as they develop policies and support strategies to be more responsive to emerging digital arts practices. Two strategies will be used to facilitate this: first, the project findings will be collated on a project website designed to read a wider public; second, the project findings will be distilled into an accessible toolkit document containing guidelines to assist development and sustainability of regional creative scenes.												
DP240100832 Kolarich, A/Prof Daniel	**The role of protein glycosylation in erythropoiesis** This project aims to understand how the sugar code of key-signalling proteins influences the development of red blood cells. This project expects to generate new fundamental knowledge in the area of stem cell signalling by innovative integration of biological and computational molecular characterisation techniques. The expected outcomes of this project include the development of novel workflows to study key regulators of cell development and the generation of new knowledge in stem cell signalling that will find applications in transforming stem cell therapies and associated research for future applications such as the laboratory manufacturing of red blood cells to close the availability gap for transfusion purposes.	125,606.00	272,710.50	280,482.50	133,378.00	0.00	0.00	812,177.00				Denmark, Ireland	
	National Interest Test Statement The research team recently identified that for the development of red blood cells in culture the use of specific molecules delivers five times larger cell numbers with overall improved health status. To date key-aspects of stem cell signalling to direct development into the desired cell types are still not fully understood. Such a fundamental understanding, however, is imperative to 1) ensure the safety of such treatments and 2) optimise the production to deliver a maximum of product for therapeutic applications. This project addresses this research gap. The outcomes will have benefit for stem cell therapy research and future therapeutic applications that are promising to deliver game-changing solutions for the treatment of diseases of societal and financial impact, such as cardiovascular diseases or cancer. Conservative estimates predict these to cost the Australian economy an excess of $300 billion in healthcare costs and productivity losses within the next 10 years, which can be significantly lowered by novel stem cell therapies. The outcomes will have direct translational impact for the ex-vivo manufacturing of red blood cells. The adoption of the developed strategies and research outcomes will allow the team to engage with national and international academic and industrial stakeholders in stem cell therapy to further strengthen Australia's world-leading role in this novel area of stem cell research to develop novel strategies for the treatment and disease management.												
DP240100892 Zhong, A/Prof Yu Lin	**Empowering Wearable Smart Devices with 3D Printed Energy Storage** This project aims to design and develop functional nanomaterials and nanocomposites for high-performance wearable energy storage devices. A functional materials approach, together with precise control of device architecture through multi-materials additive manufacturing will be used to achieve maximum device performance. The expected outcomes include (i) fundamental understanding the structural-property relationships of materials and devices and (ii) the establishment of the fundamental principles on the microfabrication of flexible energy storage devices. The project secures Australia's leading position in materials chemistry and advanced manufacturing, bringing	88,750.00	179,500.00	181,500.00	90,750.00	0.00	0.00	540,500.00				Singapore	

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	economic benefit through the commercialisation of wearable devices. **National Interest Test Statement** Battery for wearable systems has a huge market with massive economic benefit for Australia. Wearable smart devices for health monitoring has become very popular but traditional rigid batteries are not suited to be flexibly integrated. To address this shortcoming, the project will employ innovative chemistry, functional nanomaterials and advanced 3D printing technologies to safely increase storage capacity and life of wearable energy storage devices. To this end, the project will create new understanding in the field of materials science and establish fundamental working principles on the microfabrication of these wearable devices. On top of powering wearable applications such as health monitoring, the knowledge and technologies developed by this project will benefit the rapid development of cutting-edge 3D printing techniques and cost-effective flexible energy storage devices that are urgently required by many industry sectors. This project will develop new intellectual property (IP) that will assist the manufacture of new high performance flexible batteries thus contribute to the development of a new high-tech manufacturing industry in Australia. Due to the huge commercial viability, the project prototypes are likely to lead to industry partnerships toward commercialisation of the resultant IP. In addition to scientific publications, the success stories from this research will be shared on news outlets and social media to promote the future outlook of wearable technologies.												
DP240101108 Nguyen, Dr Quoc Viet Hung	**Privacy-Aware and Personalised Explanation Overlays for Recommender Systems** AI-powered recommender systems provide recommendations for daily lives, but they need to be legally interpretable and explainable. This project aims to transform existing black-box recommender models into transparent and trustworthy decision-support systems. The resulting tools will offer granular, explorable rationales for the recommendations in real time, creating greater public confidence while advancing the field. The expected outcomes include graph embedding methods for capturing real-world relationships in all their messiness and complexity. The anticipated contributions include impartial and accountable recommender models that are resistant to adversarial attacks and that slow the spread of misinformation.	17,185.00	102,713.00	171,056.00	85,528.00	0.00	0.00	376,482.00					
	National Interest Test Statement This project responds to the federal government's newly established Artificial Intelligence Ethics Framework to address the public's lack of trust in AI-based decision-making tools. It creates new open-source frameworks capable of transforming existing 'black-box' predictive models into tools that provide transparent and trustworthy insights for empowering human decision-making. Concerns over AI bias and opacity in automated decision-making have caused Australian businesses to lag behind their global counterparts in AI adoption. By delivering a system that adds explainability to online platforms, this project will strengthen Australia's competencies in advanced manufacturing and commercial activities, as well as establish translation pathways for industries that need AI decision-making such as transportation, e-health, e-commerce, and media & communication. To realise such a transformation, this project leverages the established advisory board of interdisciplinary specialists from university commercialisation offices and stakeholder organisations.												
DP240101534 Oliver, Dr Paul M	**Is New Guinea the missing link for understanding Australia's rainforests?** This project aims to understand the extent to which the animals in Australia have shared histories with animals from the islands of Melanesia, and especially New Guinea. Key outcomes will be identification of hotspots of unique and high evolutionary diversity across both regions, and understanding of whether New Guinea has been an overall refuge or source for rainforest animals as Australia became more arid over the last 20 million years. Expected benefits include addressing fundamental gaps in	81,129.00	185,800.50	195,015.50	90,344.00	0.00	0.00	552,289.00			New Zealand, Papua New Guinea, Indonesia, United States of America		

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	our knowledge of the history of both the Australian continent and its resident biota such as when landbridges first formed with New Guinea, and the identification of priority areas for conservation investment in both Australian and Melanesia.												
	National Interest Test Statement												
	This project seeks to fill a key gap in our knowledge of Australia's richest terrestrial biomes - specifically to what extent is the rainforest biota of Australia shared and linked with that on islands to the north of Australia, and especially New Guinea – the world's largest, highest and most biodiversity-rich tropical island. To address this knowledge gap we will undertake the first comprehensive integrated analyses of patterns of shared animal diversity and dispersal across these two historically linked, but currently disjunct landmasses. Analyses of dispersal patterns will refine the development and implementation of new methods for co-estimating patterns of evolution across distantly related groups of animals and plants, and underpin the first comprehensive analysis and insights on when and how a smaller island like New Guinea may be able to function as a net source of biodiversity to a larger nearby continent like Australia. Synthetic analyses of the distribution of rainforest species across both regions will also lead to more accurate understanding of where hotspots of rainforest biodiversity are located, and thereby provide a spatial framework for collaborators in management agencies to maximise conservation return on investment across Australia and Melanesia, for example through initiatives to develop, accredit and support carbon-offset schemes.												
DP240101547	**Temporal Graph Mining for Anomaly Detection**	77,778.00	158,056.00	160,556.00	80,278.00	0.00	0.00	476,668.00			United States of America		
Pan, Prof Shirui	This project aims to develop new technologies to detect anomalous patterns from dynamic networked data. Anomalies in networked data are commonly seen but are often hidden within the complex interconnections of large-scale, heterogeneous, and dynamic data, rendering existing detection methods ineffective. This project expects to design novel temporal graph mining techniques to compress large-scale networks, unify heterogeneous information, and enable label-efficient anomaly detection. The performance will be assessed in social and business networks, with significant benefits to governments and businesses in many critical applications, including cyberbullying detection, malicious account detection, and cyber-attack detection.												
	National Interest Test Statement												
	Australians and Australian businesses are now facing a significant challenge – detecting abnormal activities over networked data (e.g., fraudulent behaviours and cyberattacks). The most recent incidents caused by anomaly behaviours (cyberattacks) cost Optus $140 million and $35 million for Medibank to cover data breaches. The best system to meet this challenge is graph-powered AI techniques, which can identify hidden patterns inside complex networks. However, because data are typically formed as networks, and they are dynamically expanding over time, existing systems are incapable of detecting and combating malicious activities. This project will develop a game-changing model for the accurate detection of anomalies from dynamic networks. Its immediate applications in cyberbullying, security fraud, and cyberattacks are urgent and vital for Australian companies, organisations, and governments. This project will deliver fundamental knowledge for understanding complex anomalies in the Australian private and public sectors. The tools developed will benefit Australian businesses by reducing the risk of financial loss by millions of dollars and will combat the social harms caused by activities like cyberbullying on social networks. To achieve this outcome, commercialisation and development of the resultant intellectual property will be explored with Australian industries.												
DP240101559	**Innovative Electrohydrodynamic Atomisation for Improved Nasal Drug Delivery**	101,973.00	192,158.50	183,060.00	92,874.50	0.00	0.00	570,066.00			Japan		
Dau, Dr Van T	Inhalation offers high and rapid drug absorption into the bloodstream. This project aims to establish key technologies for a revolutionary system in inhaled nanomedicine delivery. The study will investigate the underlying physics of nanoparticles to create a world-first												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	electrostatic nebuliser, enabling the more effective drug delivery. This technique is expected to overcome the current limitations by providing better control over the size and charge of delivered drugs. The outcomes of this project will benefit pharmaceutical companies in developing products with more efficient nasal delivery of advanced drugs, vaccines, and nanocariers, make it easier for doctors to prescribe, and benefit patients with more accurate dosages.												
	National Interest Test Statement												
	Inhalation provides quick delivery of nanomedicine to the lungs with high efficacy, second only to injection. However, current nebulising techniques have several limitations, including high drug loss, inadequate penetration of the respiratory system, and low efficacy. This study investigates the underlying physics of charged nanoparticles, to enable their manipulation and create a world-first electrostatic nebuliser device, allowing the more effective delivery of drugs through airways. The market for inhaled medical devices was valued at $27.6 billion in 2020 and is expected to reach $39.8 billion by 2025. This project will increase Australia's participation in this high-value market and create highly skilled jobs in the field. The IP generated from this project will be licensed to pharmaceutical companies, providing them with commercial benefits. Adoption of this technology by pharmaceutical companies is also expected to benefit doctors through the ability to prescribe and deliver advanced drugs and vaccines more efficiently through patients' narrow airways. Consumers are expected to benefit through less side effects from the more accurate delivery and dosage of these medicines. This project and its technology have clear salience with an identified national priority.												
DP240103048 Forde, Prof Susan	**Voice and Belonging: Pathways to inclusion for new migrant communities** This project investigates the role of Australia's ethnic media in the humanitarian and refugee settlement experience, conceptualising media engagement as a key lens through which to foster a sense of belonging. The project expects to provide the first-ever national study of ethnic media, mapping the 'migrant mediasphere' with a focus on new humanitarian and refugee communities. Expected outcomes include conceptual advances about media engagement and public connection for new and emerging migrant communities, and media's place in the assemblage of humanitarian settlement services. Significant benefits emerge for humanitarian and refugee arrivals, for media trying to service these communities and for policymakers in urban and regional areas.	47,614.50	142,151.00	145,479.00	50,942.50	0.00	0.00	386,187.00			France, Spain		
	National Interest Test Statement												
	This research offers ways for humanitarian and refugee migrants to connect with their new home communities through engagement with Australia's migrant-led, ethnic media. There is significant evidence that media engagement leads to a stronger sense of belonging and inclusion for migrants, particularly those who have arrived on humanitarian and refugee visas. Official settlement services meet immediate housing, employment, school and training needs but evidence shows migrants from new and emerging communities face a swathe of other significant social and cultural challenges that these official services struggle to meet. This occurs in both urban and regional Australia, where a large number of Welcome Zones exist to bring humanitarian and refugee migrants to particular areas. The large and diverse ethnic media in Australia continues to try to find ways to engage with these new communities and to enhance their settlement experience, but pilot research for this project has discovered substantial gaps in current services. This project uses the Australian ethnic media sector as a focus to deliver migrant-led and community-led support to new humanitarian and refugee arrivals, through community-based media organisations. In doing this, the research adds a 'community connection' dimension to existing government-provided settlement services, investigating ways that local, community-based media can benefit our most vulnerable migrants -- those arriving on humanitarian and refugee visas.												
	Griffith University	700,334.00	1,595,780.00	1,637,743.50	742,297.50	0.00	0.00	4,676,155.00					

James Cook University

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101938 Cernusak, A/Prof Lucas A	**Australian tropical rainforests in the face of climate change** This project aims to investigate the roles of increasing atmospheric water stress and rising carbon dioxide in driving changes in tree performance and species composition in Australian tropical rainforests. Forest census plots indicate increasing tree mortality, but the mechanisms through which this is occurring are unknown. Experiments will be conducted to unravel the underlying physiological processes. Community-level behavior will be investigated with flux tower and remotely sensed data. The project expects to generate new knowledge of how Australian tropical rainforests are responding to climate change. The expected outcome is an enhanced capacity to understand and manage a highly valued component of the Australian forest estate.	87,086.00	212,143.00	186,628.00	61,571.00	0.00	0.00	547,428.00			England, Switzerland, Panama		
	National Interest Test Statement Humans are transforming the global environment in fundamental ways. One of the most impactful of our collective actions has been to raise the atmospheric carbon dioxide concentration from 280 parts per million before the industrial revolution to about 420 today. Plants interact directly with atmospheric carbon dioxide through the process of photosynthesis. Elevated atmospheric carbon dioxide can drive faster photosynthetic rates, but it has also caused warming of the atmosphere and land surface, which can stress vegetation. We will investigate how these atmospheric changes are impacting the world-heritage listed wet tropical rainforests of far north Queensland. We will unravel the mechanisms through which warmer air can cause increasing tree mortality in moist forests where soil water availability generally does not constrain tree growth. We will also investigate whether trees at the dry edge of the rainforest are benefitting from increasing water-use efficiency caused by the rising atmospheric carbon dioxide levels. Results will improve our understanding of the impact of global climate change on the composition and function of Australia's unique tropical rainforests, and tropical rainforests globally. This will provide crucial information for land managers, conservation practitioners, and the restoration sector to better prepare for the future. Results will also inform sound policy decisions to slow the rise in atmospheric carbon dioxide and stabilize global climate.												
DP240102310 Miller, Prof David J	**Understanding specificity and flexibility in coral symbioses** This project aims to understand why some corals can switch algal partners while others remain faithful to a single strain. This is important because corals depend on their symbiotic algal partners for survival and because some algae provide greater resilience to environmental stress than others. This project will greatly enhance our understanding of the molecular and physiological factors governing flexibility and specificity in coral-algal symbioses. It will provide much-needed knowledge required to identify associations most appropriate for specific conditions, prioritise populations for conservation, and assess the feasibility of new approaches to managing and restoring coral reefs.	35,390.50	101,641.00	156,734.50	150,897.50	60,413.50	0.00	505,077.00			Japan		
	National Interest Test Statement Australia’s world heritage listed coral reefs, the Great Barrier Reef and Ningaloo Reef are precious assets with immense cultural and economic value. The GBR alone contributes around 6.4 billion dollars annually to the Australian economy and supports over 64 thousand jobs. Protecting these reefs against damage from global warming and other human impacts is a complex task and it is often difficult for management agencies to weigh up the efficacy and risks associated with proposed conservation actions. Contributing to this complexity is the fact that corals are critically dependent on symbiotic algae for their health and survival. Some species of corals can associate with a variety of algae while others are extremely faithful to a single algal partner. Understanding why some corals can switch algal partners and others cannot is important because recent research has shown that												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	certain species of symbiotic algae might allow corals to better survive marine heatwaves caused by global warming. The goal of this research proposal is to identify groups of genes in corals and in symbionts that govern this ability to switch and the potential benefits of doing so. It will contribute to Australia's efforts to conserve coral reefs by providing foundational knowledge needed to predict the efficacy of conservation actions involving new combinations of corals and their symbionts.												
	James Cook University	122,476.50	313,784.00	343,362.50	212,468.50	60,413.50	0.00	1,052,505.00					
Queensland University of Technology													
DP240100072 Ekberg, A/Prof Stuart J	**Understanding communication about advance care planning across the lifespan** This project aims to understand how people communicate about advance care planning for children, adolescents, and adults. This project expects to generate new knowledge by using leading social scientific and linguistic methods to analyse real-world advance care planning conversations and documents. Expected outcomes include detailed knowledge about challenges people encounter in these conversations and how to manage these challenges. Over 170,000 Australians die each year, most from serious illness. This project should provide significant benefits to future initiatives for enhancing communication about advance care planning, especially in relation to young Australians, older Australians, and Australians with disabilities.	96,176.00	182,921.00	163,553.50	76,808.50	0.00	0.00	519,459.00			Singapore, Hong Kong (SAR of China)		
	National Interest Test Statement Planning for the future when diagnosed with a serious illness is a reality confronted by the majority of Australians at some point in their lives. The Australian Government recognises the importance of proactive planning in the context of serious illness. In 2021, it released a National Framework for Advance Care Planning Documents. The success of these documents requires effective communication between stakeholders about goals, values, and preferences for care. The project aims to deliver, for the first time, detailed linguistic evidence about what makes these conversations effective. This research could benefit Australians by ensuring future policy and training initiatives incorporate evidence-based guidance on how to operationalise principles of advance care planning in practice, through effective communication. The research outcomes will be promoted beyond academia via existing programs led by the investigators or by industry partners who the investigators have existing collaborative relationships with. These include Palliative Care Australia, the Office of Advance Care Planning (OACP), the Quality of Care Collaborative for Australia in Paediatric Palliative Care (QuoCCA), End of Life Directions in Aged Care (ELDAC), the Palliative Care Curriculum for Undergraduates (PCC4U), and the Program of Experience in the Palliative Approach (PEPA).											
DP240100389 Miljevic, A/Prof Branka	**Southern Ocean aerosols: sources, sinks and impact on cloud properties** This project aims to provide fundamental process-level understanding of atmospheric aerosol processes over the Southern Ocean, a region that has a profound influence on the Australian and global climate and where climate models perform poorly. Comprehensive observations during 3 Southern Ocean voyages and land-based measurements will enhance our knowledge of aerosols and cloud formation in that region and provide much-needed data for improving global climate models. Expected outcomes include more accurate seasonal and latitudinal representations of Southern Ocean aerosol	93,035.00	186,651.50	162,515.00	68,898.50	0.00	0.00	511,100.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	populations, properties and sources. The main benefit includes improvements in weather forecasting and future climate projection for Australia and the Southern Hemisphere. **National Interest Test Statement** Atmospheric processes over the Southern Ocean have a profound influence on regional and global climate. This is a part of the world where global climate models perform particularly poorly. This project is addressing the greatest source of uncertainty in climate models – atmospheric aerosols and how they influence cloud formation. Observational data for the Southern Ocean are scarce and this project is a unique opportunity to gather much-needed observations in this region. By using state-of-the-art instrumentation during 3 voyages on the Australian research vessel Investigator and research and supply vessel Nuyina, and year-long land-based measurements, the project will enhance our knowledge of the aerosol formation processes over the Southern Ocean, the role of marine biota on aerosols as well as aerosols' seasonal and latitudinal variability. Expected outcomes include more accurate representations of aerosol populations and properties over the Southern Ocean. The main benefit is improvements in weather forecasting and more robust climate projections for Australia and the Southern Hemisphere. This will better prepare Australia for the challenges of a variable and changing climate.												
DP240100612 Blanksby, Prof Stephen J	**Reactivity and photochemistry of halide anions: atmospheric implications** Bromine and iodine are suspected to be responsible for most of the halogen-induced ozone loss in the stratosphere but are not currently included in atmospheric models due to a paucity of knowledge of the gas-phase chemistry and photochemistry of their anions and radicals. This project will develop and deploy advanced mass spectrometry and laser spectroscopy techniques to enable precision measurements of the reactions and photo-reactions of gas-phase iodide and bromide anions and their oxides. These state-of-the-art measurements of reaction kinetics and products will enable accurate chemical models that predict the impact of bromine and iodine chemistry on ozone levels and will inform future models for global climate. **National Interest Test Statement** The Australian population, environment and economy are all vulnerable to depletion of the ozone layer that protects human, animal and plant life from dangerous ultraviolet radiation. Recent atmospheric measurements, including those in Australian territories, indicate significant changes in the levels of gases containing the elements bromine and iodine. Chemical reactions of these gases could be ozone depleting but are not currently included in the atmospheric models of the ozone layer because the relevant chemical reactions have not been measured. This project will deliver accurate laboratory measurements for the chemical reactions of gases containing iodine and bromine that will be incorporated into atmospheric models developed by national and international agencies. The improved accuracy of these models will allow reliable forecasting of future changes in the ozone layer and levels of ultraviolet radiation at the Earth's surface. Such prediction will inform national strategies and interventions that protect: the health of Australians; our unique environment; and the competitiveness of our agricultural industries.	111,834.00	209,668.00	126,269.00	28,435.00	0.00	0.00	476,206.00			United States of America, Belgium		
DP240100992 McIlroy, Dr Simon J	**The mobilome of the anaerobic methanotrophic archaea Methanoperedenaceae** Microorganisms play a critical role in regulating Earth's climate, but how they are affected by our rapidly changing environment is not well understood. This Discovery project will study a group of microorganisms found in freshwater sediment that can consume the potent greenhouse gas methane before it is released into the atmosphere. We have developed new methods to investigate how genetic	75,750.00	160,146.50	173,945.50	89,549.00	0.00	0.00	499,391.00			Spain, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	material is exchanged between microorganisms, and how this helps them adapt to environmental changes. Together, this will ultimately help us develop better climate change prediction models and contribute to our understanding of microbial communities that are crucial for environmental health. **National Interest Test Statement** In order to adapt to rapidly changing environments, microorganisms have developed diverse strategies that allow them to exchange DNA between one another. This has a substantial impact on their survival, evolution and biological function; however, our understanding of these strategies remains limited. This Discovery project will investigate adaptive mechanisms of genetic exchange in a group of microorganisms that are responsible for preventing the atmospheric release of the potent greenhouse gas methane. This will advance our understanding not only of the microbial role in methane cycling, but how genetic material is exchanged more broadly between microorganisms. Given their impact on agriculture, waste treatment, food production and human health, our ability to study complex microbial communities, including those that play a critical role in regulating Earth's climate, is of tremendous value to Australia. To maximise the impact and benefit of this work, we will promote collaborations across disciplines (e.g., microbial ecology, computational science, climate science) and industries (e.g., technology development, education) and hold educational seminars.												
DP240101533 Vallmuur, Prof Kirsten	**Addressing significant product safety knowledge gaps for older Australians** This project addresses significant gaps in contemporary knowledge of consumer product safety risks for older persons, with 25 years since the last Australian product safety research found older persons are at high risk of product-related injury/death. Products have evolved substantially and aged care models have changed in that time. This project generates contemporary knowledge of unsafe products causing injuries/deaths, risk factors/behaviours, and human rights issues. Outcomes benefiting the Australian community are improved prediction/characterisation of product safety issues for older Australians informing safer product design and use, targetted regulatory responses, ageing-in-place strategies, and creating safer home environments.	62,313.00	187,810.00	204,669.50	79,172.50	0.00	0.00	533,965.00			United States of America		
	National Interest Test Statement Older persons as a cohort are at high risk of product-related injury and death. The most recent Australian research into product safety issues for older persons was conducted over 25 years ago, yet the marketplace and product technology have changed dramatically and the population at risk has grown. This project generates contemporary knowledge of the role of consumer products in injuries and deaths for older Australians, leading classes of hazardous products, risk factors and high risk behaviours, and human rights issues. Expected outcomes are improved prediction and characterisation of product safety issues to inform product safety risk narratives and prevention priorities. This knowledge benefits older Australians by informing purchasing decision-making and product use, industry by informing safer product design, and government by informing ageing-in-place strategies and regulatory responses such as recalls and safety standards. Active involvement of industry, government, advocates, health professionals and consumers in the project will aid in the translation of outcomes to create safer home environments.												
DP240102053 Gui, Dr Yilin	**A Novel Surrogate Framework for evaluating THM Properties of Bentonite** Compacted bentonite as favoured engineered barrier material is widely used in environmental geotechnics and its failure can incur huge societal, economic and environmental loss. The project aims to develop a novel surrogate model to identify the optimal controllable factors'	76,585.00	159,516.50	165,265.50	82,334.00	0.00	0.00	483,701.00			Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	value to increase barrier's integrity and reliability. It expects to advance the fundamental knowledge of bentonite thermo-hydro-mechanical properties through advanced molecular dynamics modelling, statistic learning and machine learning. It will deliver revolution design approach for bentonite used in engineered barriers in Australia and internationally. In the long-time it will bring huge economic, societal and environmental benefits to our community. **National Interest Test Statement** Bentonite is used in many engineering and science areas. One of the typical applications is engineered barriers used in nuclear waste deep geological disposal facilities and landfill linear where compacted bentonite is an important component of the barriers. The role of the barrier is to contain toxic and harmful waste and radiation from the decay of nuclear waste and isolate it from surrounding environment. However, there are still some existed challenges, for example moisture variation induced volume shrinkage and failure of barriers and unsatisfied hydraulic conductivity and diffusion. By virtue of advanced computational modelling, statistic learning and machine learning approaches, this project is seeking to build a robust, efficient and reliable surrogate model to optimally and efficiently identify best practice of bentonite barrier construction through controlling the conditions/influence factors. Through this study the bentonite barriers' thermo-hydro-mechanical properties and their influence factors will be comprehensively investigated and correlated. The proposed model will directly benefit the customers and users of bentonite engineered barriers, with escalated confidence. The research will minimise the damage and loss caused by compacted bentonite problems and considerably reduce the costs incurred by Australian federal and state governments and relevant industry for repair and reconstruction, as well as the socio-economic and environmental impacts.												
DP240102235 Golberg, Prof Dmitri	**“Janus” Transition Metal Dichalcogenides: Quest for Novel Properties** Novel two-dimensional nanomaterials – so called “Janus” transition metal dichalcogenides (TMDs) - are featured by breaking out-of-plane structural symmetry that enables prolongated exciton lifetime, strong spin-orbit coupling, large vertical piezoelectric polarization, and exceptional electromechanical properties. We plan to develop reliable and efficient synthetic routes for various "Janus" TMDs and their heterostructures, to investigate their physical properties, and find the ways of property tailoring. Deep understanding of structure-property relationships uncovered for these materials will pave the way for transferring discovered new features into cutting-edge technologies in electromechanical, optoelectronic, and catalytic fields. **National Interest Test Statement** New atomically-thin two-dimensional (2D) inorganic nanostructures have emerged as a booming field of modern physics, chemistry, materials science and nanotechnology. Their smart use in the state-of-the-art and future electronic devices could make a huge difference with respect to mobility of electrons and effectiveness of semiconducting circuits. So-called "Janus" 2D transition metal dichalcogenides (TMDs), in which two different chalcogen atoms, e.g., sulfur, selenium and/or tellurium, are alternatively located on the opposite sides of the transition metal atomic layers, have recently become of prime interest, as they open up a wide horizon for new findings and striking discoveries. Strategically, the project aims to establish Australia's first laboratory dedicated to the effective synthesis of Janus TMD multi- and mono-atomic-layer materials and their heterostructures. We will initiate the ultimately optimised syntheses of Janus TMDs, exploration of their unknown physicochemical properties, and construction of prototype Janus TMDs high-tech devices, while combining in-depth first-principle theoretical calculations, and experimental verification using modern experimental techniques, e.g., atom-resolved analytical and in situ transmission electron microscopy, ion-microscopy, scanning tunnelling microscopy, and atom force microscopy. The project outcomes will be beneficial for Australia's cutting-edge technologies in electromechanical, optoelectronic, and catalytic fields.	70,000.00	117,500.00	94,500.00	47,000.00	0.00	0.00	329,000.00			Germany		
DP240102717	**Designing distanced intergenerational interaction with tangible technology**	86,134.00	201,746.50	247,848.00	173,948.00	41,712.50	0.00	751,389.00			Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Blackler, Prof Alethea L	Older people and their young relatives/grandchildren who are geographically distanced cannot currently experience closeness in tangible ways, which are the natural ways they would play and build relationships in “real” life. Enabling this connection would have positive impacts for both groups, and two types of technologies – Mixed Reality and Tangibles - can be explored to allow us to understand how to do this. We will develop approaches to distanced tangible intergenerational interaction which are designed specifically to increase intergenerational closeness and to be innovative and subtle so that they fit seamlessly into the lives of older people and young children.												
	National Interest Test Statement												
	Geographically separated families can communicate more quickly, easily and cheaply than ever before, but this communication is intangible and is conducted on the terms of the technology not the communicators, is inflexible and not generally very playful. This makes it hard for children and their grandparents or older relatives to form strong relationships and bridge generational divides. We will investigate how different types of technology-enabled tangible interaction could be designed to increase closeness between children and their distanced grandparents or older relatives. The benefits of the project include increased and more authentic intergenerational engagement leading to deeper relationships, and reduced levels of loneliness and isolation among older adults and young children. For Australia, where around half of us were born overseas or have a parent who was born overseas, this is an urgent problem which we can lead the world in addressing. Outcomes include: a better understanding of the impact of intergenerational engagement on closeness which will contribute to research; a design methodology for creating smart tangible systems that facilitate intergenerational engagement that will disseminated to design practitioners; and practical frameworks, guidelines or toolkits for families and other practitioners, such as social workers or aged care professionals, to use to create such systems or to use them within their interventions.												
DP240102728 Sun, Prof Ziqi	**Fire-retardant Solid State Electrolytes for Rechargeable Li-ion Batteries** This project aims to develop solid-state composite electrolytes combining exceptional flame retardancy and high ion conductivity for lithium-ion batteries. By leveraging merits of both polymer and ceramic electrolytes, the resultant composite electrolytes are expected to enhance battery safety by replacing existing flammable liquid counterparts. The project will advance the knowledge on the design and optimization of solid-state electrolytes, and the understanding on the fire-retarding and ionic conducting mechanisms of composite electrolytes. The outcomes of this project will contribute to the reduction of battery fires, the skills development in the Australian battery industry, and the advancement of a sustainable carbon-zero economy.	88,535.00	180,857.50	189,211.50	96,889.00	0.00	0.00	555,493.00					
	National Interest Test Statement												
	The global energy storage market is experiencing rapid growth due to the increasing demand for renewable energy sources, particularly lithium-ion batteries. However, the flammable liquid electrolytes in batteries pose a significant threat to communities' safety and finances. To address this issue, this project aims to develop solid-state electrolytes with self-extinguishing properties and high Li+ ion conductivity, leveraging the properties of polymer and ceramic electrolyte materials. Through flame-retarding and ionic conducting studies of polymer/ceramic composite, this project aims to pave the way to high-performance solid electrolytes in batteries. The benefits of this project for Australia are numerous, including transforming Australian mining resources into high-value-added solid-state electrolyte materials for batteries and contributing to environmental sustainability by fostering the use of reliable all-solid-state lithium-ion batteries in electrified transportation. Furthermore, this project will aid in achieving the Australian net-zero economy goal by solving the combustion and leaking issues of batteries. This project will also generate fundamental knowledge and process techniques related to battery materials design and fabrication, which will underpin Australia's leadership in this field. The research outcomes will be disseminated												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	via conferences and publications and applied in the industry for future commercialization, ultimately creating new job opportunities.												
DP240102891 Wang, Prof Hongxia	**Novel Membranes for High-performance Zinc-Iron Redox Flow Batteries** Membrane is a critical component in zinc-iron redox flow battery (ZIRFB) which is considered a promising technology for large-scale energy storage in the future. This project aims to design and construct high performance membranes using low-cost polymers and nanostructured carbon materials through functionalization and innovative membrane structure design. The goal is to develop cost-effective membranes that possess high ion-selectivity and ion conductivity as well as stability that are required to fabricate high performance, long cycle lifetime ZIRFB. Successful achievement of the outcomes will enable cost-effective, reliable ZIRFB, placing Australia at the forefront of exploiting flow batteries based clean energy storage technologies.	94,500.00	189,500.00	192,000.00	97,000.00	0.00	0.00	573,000.00			Singapore		
	National Interest Test Statement Zinc-iron redox flow batteries (ZIRFB) are a promising energy storage technology for large-scale stationary energy storage applications due to their many advantages such as decoupled energy density and power density, safety, toxicity-free and cheap of raw materials. A membrane is a critical component in ZIRFB by separating the cathode and anode in the device. The properties of a membrane determine both the device performance and lifetime. Commercial membrane materials used in existing ZIRFB are expensive and perform poorly due to their non-ideal properties. The project addresses the critical material issues by designing and constructing new membranes using low-cost polymers and nanostructured carbon materials through material functionalisation and innovative membrane structure design. The research will generate critical new knowledge of the relationship of functional groups of polymers and structure of membrane with the critical properties of membranes for use in ZIRFB. The success of the project will contribute to reduce the cost of renewable energy in practice, providing cheap and reliable clean energy in Australia and overseas. The project research aligns the national Science and Research priority of 'Energy', and National Reconstruction Fund priority area of ‘renewables and low emission technologies’, addressing the practical research challenge of ‘New clean energy sources and storage technologies that are efficient, cost-effective and reliable’.												
DP240102939 Wikstrom, Prof Patrik L	**Australian Experiences of Algorithmic Culture on TikTok** This project is the first to systematically investigate how algorithmic content recommendation is shaping everyday Australian cultural experience over time, in the particular context of TikTok—the digital platform where Australians spend the most time online. The project provides critical evidence to support the government's ongoing policy initiatives intended to regulate the activities of digital platforms. Its methodological innovations directly address the challenges of studying commercial platforms' recommender systems through a mixed-method research design combining computational and qualitative analysis, bridging universal and individual perspectives and introducing ‘citizen science’ approaches to the field of platform studies.	62,027.50	96,940.00	69,524.50	34,612.00	0.00	0.00	263,104.00			Netherlands		
	National Interest Test Statement This project will be the first to generate systematic evidence about how the globally powerful and locally popular platform TikTok is influencing Australian culture. TikTok is the ideal case for this study because this platform (1)												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	has been at the centre of recent debates over national security and algorithmic cultures, (2) has a large global and Australian user base, and (3) is built on one of the most responsive recommender systems in the market. Using an innovative 'data donation' method that engages the public directly in the research, it investigates the output of the platform's recommender system, the content it recommends to Australian audiences, and the strategies that local creators are employing to reach them. The findings of the research will help Australian content creators to better understand how to succeed on the platform, and improve the Australian public's understanding of algorithmic recommender systems more broadly. Through our active policy translation work, the project will help inform Australian government initiatives, including the national Digital Economy and AI Regulation strategies and ACCC Digital Platform Services Inquiry; as well as providing advice about the likely local impacts of international developments such as the incoming EU Digital Services Act.												
DP240103085 Kou, A/Prof Liangzhi	**Sustainable Electrocatalytic Synthesis of Urea** Urea is a critical chemical for agriculture, the chemical industry and pollution control, yet current production methods are unsustainable. This project aims to design high-efficiency catalysts for electrochemical urea synthesis from theoretical studies. This project expects to generate new knowledge of chemistry and catalysis from new reaction mechanisms and materials. Expected outcomes include optimum catalysts with high conversion efficiency and reactant selectivity. The novel catalysts have the potential to deliver improved catalytic performance and controllable reaction reactants. This could deliver significant benefits to the crop production increase, cost reduction of chemical industry, and environmental pollution reduction.	76,185.00	156,520.00	154,385.00	74,050.00	0.00	0.00	461,140.00			New Zealand		
	National Interest Test Statement Urea is an important raw material in the chemical industry and the pharmaceutical industry, it is also widely used as a nitrogen source in chemical fertilizers and is an essential fuel additive (AdBlue) to reduce diesel pollution, however, industrial urea synthesis requires harsh reaction conditions and high-energy inputs, causing major environmental pollution. Although the annual demand for urea in Australia is up to 2 million tones (Mt), the domestic production is less than 0.5 Mt while the rest needs to be imported from foreign. This project aims to fill the gap by designing high-efficient catalysts for electrochemical urea synthesis and developing feasible strategies to improve the urea yield. The successful implementation will help Australia to build sovereign capabilities in urea production. The findings will significantly benefit agriculture by increasing the grain production, chemical industries by reducing the cost of chemical & medicine products and environment by significantly reducing the energy cost and exhaust emissions. The developed technologies and intellectual property generated from this project will create partnership opportunities with Australia's urea factories (mainly located in Queensland) through licensing and commercialization pathways for high-efficient urea production.												
DP240103230 Liao, A/Prof Ting	**High entropy metal organic frameworks for sustainable hydrogen production** The ultimate critical core for green hydrogen fuel generation is efficient and cost-effective catalysts. This project aims to design novel high entropy metal organic frameworks (HE-MOFs) using advanced high throughput computational screening integrated with experimental validation for sustainable hydrogen production. The outcome of this project will discover a new class of HE-MOFs materials with superior hydrogen generation efficiency, while also provide rational design principles for the exploration of high-efficient catalysts in sustainable fuel generation. The success of this project will help to achieve the zero-carbon target and contribute to the development of a sustainable society with low-cost and renewable energy supply.	73,505.00	138,510.00	128,760.00	63,755.00	0.00	0.00	404,530.00					
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	The rising global energy crisis urgently demands novel catalysts capable of sustainable fuel generation from water splitting through multiple functionalized active centres. This project aims to explore the mechanistic aspects of a wide range of high entropy metal organic frameworks (HE-MOFs) materials through advanced high throughput computational screening methods and experimental synthesis, characterization, and electrochemical test, which is highly beneficial to the discovery of the most optimized HE-MOFs catalysts for hydrogen generation. The key design principles achieved in the project will efficiently guide the lab synthesis and validation of predicted superior HE-MOFs, crucially reduce the cost in experimental trials, and tremendously benefit the knowledge transfer to industry know-how. The outcomes of project are crucial for addressing climate-related risks by reducing greenhouse gas emission, leveraging Australian leading profile in the sustainable fuel generation areas, as well as upgrading existing hydrogen energy technology. As the global hydrogen generation market is forecasted to reach ~225 billion USD by 2030, the exploration of cost-effective and environmentally-friendly HE-MOFs catalysts for hydrogen generation energy has the potential to replace the noble metal-based catalysts and capture a share of the market.												
DP240103307 Davies, Prof Janet M	**Digitally-Integrated Smart Sensing of Diverse Airborne Grass Pollen Sources** Grass pollen is the main outdoor allergen source globally, triggering hayfever and asthma in up to 500 million people. With over 10,000 species, the influence of grass type, location and climate on pollen in the air is not yet known. This is a key issue since subtropical and temperate grasses differ in response to environmental factors. The project aims to use artificial intelligence on digital camera images to learn to see local grass flowers and integrate this with air sensors trained to detect grass pollen types. The expected outcomes are new capacities to track airborne grass pollen types. These outcomes can transform how pollen can be monitored to reduce the burden of allergies, and provide evidence of changing airborne pollen loads.	75,378.00	208,642.00	273,570.50	140,306.50	0.00	0.00	697,897.00			Switzerland		
	National Interest Test Statement Changes in grass distributions with climate variability and extreme weather events, including successive La Nina seasons, have many consequences for agriculture and human health. Worldwide, Australia has amongst the highest frequencies of allergic asthma, and is the most vulnerable to thunderstorm asthma events, yet there is no sustained pollen monitoring system here. This research advances global scientific capability to monitor different types of airborne grass pollen. This Project increases knowledge on patterns of pollen exposure that have a direct impact on human health. Broadly, grasslands have immense economic, health and environmental value through their role in food security (grazing industry), biodiversity, biosecurity, and wildfire risk. This project should underpin decision making regarding pollen monitoring in response to Recommendation 14 of the 2020 Royal Commission into Natural Disasters for national standardized monitoring of bioaerosols including pollen. The project is aligned to Commonwealth investment in the National Allergy Centre of Excellence and can assist the new National Allergy Council to support the public. The novel use of digitally-integrated time series camera images based on artificial intelligence to recognise grasses, and features of other plants such as weeds, also has agricultural importance. The project will contribute data to the Australian Research Data Commons, Atlas of Living Australia, and the Global Biodiversity Information Facility.												
DP240103362 Harrington, A/Prof Stephen M	**Understanding and Combatting 'Dark Political Communication'** This project examines an emergent series of tactics used by political actors (i.e. politicians, lobbyists, political groups, etc.) that we are calling 'Dark Political Communication' (DPC). DPC differs markedly from existing, well-established modes of political communication, as it often involves the deliberate spread of disinformation, use of highly inflammatory language, antagonism towards the press and democratic institutions, as well as actions that seek to exacerbate social discord. In this project, we will provide the first-ever complete account of DPC tactics, and provide a series of	112,679.00	203,728.00	192,503.00	101,454.00	0.00	0.00	610,364.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	recommendations to journalists about how their practice can best evolve to address this novel communication paradigm. **National Interest Test Statement** Both in Australia, and around the world, democracy is under serious threat from malicious political forces that aim to stoke social discord, increase cynicism in government, and undermine the public's belief in collective action on pressing global challenges. This project, the first of its kind, studies these forces under the umbrella term 'Dark Political Communication' (or, 'DPC'). DPC has already seen fundamental changes to the way that politics is conducted in our society, and severely limited our ability to respond effectively to major crises (including climate change and, more recently, the global COVID-19 pandemic). Unfortunately, the media is yet to properly understand the full extent of these changes. Even worse, many DPC operatives achieve success by exploiting the media's operating 'rules' (e.g. objectivity), meaning that journalists (often unwittingly) add to these problems, rather than work against them. This project provides a comprehensive account of how DPC operates, identifies the political figures who exploit it, helps understand how it is undermining our democracy, and provides recommendations to journalists about how they better limit its impact. Our findings will highlight, for the public, the media industry, as well as academia, the pernicious effects of DPC, and thus help to improve the overall state of our political system.											
	Queensland University of Technology	1,254,636.50	2,580,657.50	2,538,520.50	1,254,212.00	41,712.50	0.00	7,669,739.00					
The University of Queensland													
DP240100277 Zhu, A/Prof Min	**Limiting False Positives in Empirical Asset Pricing Tests** The project aims to address the issue of data mining in asset pricing tests using innovative interdisciplinary approaches that mitigate the occurrence of false positives. The expected outcomes include extended options in finance for alleviating data mining, as well as new guidelines for rigorously evaluating the explanatory power of risk factors on expected returns. The project findings are expected to significantly advance our understanding of the pricing of risk. Additionally, the proposed tools are anticipated to have broad applications, such as corporate finance and fraud detection, and offer significant value to finance research and its stakeholders, such as the Australian asset management industry and government regulatory bodies. **National Interest Test Statement** This project aims to develop a range of novel tools that improve empirical asset pricing tests and decision-making in the face of increasing occurrence of false positive results. The goal is to provide market participants with a better understanding of the various factors that influence asset prices so that they can make informed decisions. An important outcome from the project is a set of new methodologies and guidelines to identify investment opportunities and skilful funds that deliver performance. This will provide benefits to the Australian asset management industry and government bodies, who regularly rely on financial research to guide their capital allocation and regulatory decisions. To deliver these benefits, we aim to engage in a variety of outreach and communication activities including mainstream newspaper articles, podcasts, and public talks/workshops though the Australian Asset Management Council and to a number of specific business entities in our network, such as UniSuper, Queensland Investment Corporations, Investors Mutual Limited, Mercer Australia, and Schroders. We also aim to develop policy briefs, provide input to expert groups, participate in consultations and select committees for the Australian Securities & Investments Commission (ASIC), particularly relating to the superannuation fund performance test, which is currently one of the focuses of ASIC's work in the superannuation sector.	54,232.50	102,659.00	98,492.50	50,066.00	0.00	0.00	305,450.00			Singapore, United States of America, China (excludes SARs and Taiwan)		
DP240100464 Jacobson, Dr Peter A	**Atomic-Scale Engineering of Bioactive Organic Molecules on Surfaces** Advances in scanning probe microscopy (SPM) have	54,245.00	110,720.00	112,950.00	56,475.00	0.00	0.00	334,390.00			Austria, Switzerland		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	enabled the precise engineering of matter at surfaces. The ability to image and track changes at surfaces is simply staggering, but the frontier of molecules with pharmaceutical and agrichemical importance remains unexplored. This interdisciplinary project aims to synthesise fundamental molecules and reveal molecular rearrangement pathways utilising SPM. Expected outcomes of this project include new methods to couple molecules otherwise unobtainable by traditional means and fundamental knowledge of molecular manipulation and chemical structure. This aims to provide significant benefits, such as the translation of new chemical principles to academic and industrial laboratories. **National Interest Test Statement** Australian researchers have shown that chemical substitutions can lead to better pharmaceuticals and agrichemicals. By using these chemical substitutions, they have unlocked a vast library of bioactive compounds with the potential for improved efficacy. Through cutting-edge molecular imaging and single-molecule chemistry, this project aims to uncover the reaction pathways of these molecules and how they change shape under external stimuli. Understanding the path these molecules take as they change shape is the key to developing new applications and more efficient methods of synthesis. The ultimate goal is to develop new methods of synthesising complex, functional molecules from simple precursors, leading to a wider range of applications for these compounds.												
DP240100798 Hornsey, Prof Matthew J	**Mapping the psychology of accent-based discrimination** Accentism is commonplace, but our understanding of why people discriminate against certain accents is limited. This project will develop a Global Database for Accented English, an archive of piloted speech samples that dramatically reduces interpretational difficulties plaguing existing research. This resource enables the most robust test to date of what causes accent bias in schools and workplaces. Experiments will also examine the conditions under which accent bias is most pronounced, and why its effects are particularly strong for women. Understanding mechanisms underpinning accent bias is a precondition for reducing a problem that threatens Australia's status as a successful and economically vital multicultural society. **National Interest Test Statement** Accentism has been described as the last remaining socially acceptable prejudice. Schoolchildren with non-standard accents are more likely to be socially excluded, students with non-standard accents are more likely to be discouraged at university, and job applicants with non-standard accents are less likely to get the job. Anecdotal research shows that it a major reason for people to leave countries and for students to drop out of universities. Indeed, experimental research suggests that the effects of accent on one's ability to advance through life are considerably bigger than equivalent effects of race and sex. This represents a threat to the economic and social wellbeing of a multicultural country like Australia, particularly given our high levels of immigration and talent shortages in skilled industries. The current program combines a series of methodological innovations to provide the most robust test to date of what causes accent bias, insights that will help inform strategies for reducing the problem. Operating in parallel with the research program is an awareness-raising program designed to reduce accent-ism, and in turn shape a fairer and more economically competitive Australia. A legacy of the program will be an open-access Global Accent Database, one that can provide a step-change in researching and understanding accent bias in Australia.	89,679.00	176,565.00	105,264.00	18,378.00	0.00	0.00	389,886.00					
DP240100961	**Porous Two-Dimensional Inorganic Semiconductors for Optoelectronic Devices**	75,000.00	150,000.00	150,000.00	75,000.00	0.00	0.00	450,000.00			Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Yamauchi, Prof Yusuke	This project aims to develop new highly porous two-dimensional (2D) inorganic semiconductors for advanced photodetectors. The key concept is to combine electrochemical deposition and post-growth plasma treatment to tune the optoelectronic properties of these materials. This project expects to generate new insights into the correlations between different pore parameters and plasma treatment conditions for 2D inorganic semiconductors and new advanced materials with high sensitivity and broad spectral range for photodetectors. The project is expected to provide significant benefits by advancing Australia's capability in the manufacturing of inorganic semiconductors and photodetectors for application in optical communications and sensors. **National Interest Test Statement** Photodetectors work by converting information carried by light into an electrical signal and are used in optical communications, biomedical imaging, security, and environmental monitoring. Traditional semiconductors used in photodetectors have several drawbacks, including lack of mechanical flexibility, limited operating range, and complex processing, thus limiting their application in developing cost-effective and energy-efficient photodetectors. As the global market for photodetectors is expected to rise to $1.8 billion by 2024, the development of new semiconducting materials with broad spectral range and easy processing is a commercial necessity. This project aims to develop new two-dimensional inorganic semiconductors with high responsivity, sensitivity, and wide operating spectrum for next-generation photodetectors. The project will generate fundamental knowledge in materials science and optoelectronic device fabrication and provides a feasible and cost-effective approach for realising significantly improved photodetectors. Through industry partnerships and licensing of IP, the project will provide a new route for scale-up production of new semiconductors and high-performance photodetectors which can be adopted by the Australian optoelectronics, biomedical and defence industries.												
DP240101026 Dunn, A/Prof Daniel C	**Understanding marine migratory connectivity for more sustainable oceans** Ocean basin-scale migrations of iconic sea turtles, marine mammals, seabirds, and fish expose them to multiple stressors and governance regimes, leading to gaps in management and population declines. The project aims to deliver the methods and evidence base of cross-taxa migratory connectivity that is essential to support the conservation of these species. Expected outcomes include comprehensive and integrated models of migratory connectivity, conservation theory development, and new methods that allow incorporation of migratory connectivity in conservation planning. Benefits include: a cross-taxa baseline that will enable Australia to measure environmental change in marine migratory connectivity for the first time. **National Interest Test Statement** Migratory marine mammals, sea turtles, seabirds, and fish play critical roles in delivering ecosystem functions, linking their conservation to broader habitats and the well-being of humans. Yet management strategies for migratory species have proved inadequate, and fish stocks that cross a border experience twice the rate of overfishing as those within a single country. Management is hampered by a lack of coordination and single-species approaches that focus on individual stages of a migratory cycle. Conservation of these species requires better understanding of their habitat use and migratory patterns. This project will create an evidence base of marine migrations that will help us understand trends and ways to include migration patterns in the siting of protected areas. Industries and government managers will use this new knowledge to underpin more effective planning and management, leading to recovery of threatened species and thereby supporting Australia's commitment to halting biodiversity loss, and protecting the wildlife-watching and scuba-diving tourism industries in Australia, worth >$2.5 billion.	93,247.00	200,445.50	107,198.50	0.00	0.00	0.00	400,891.00			United States of America, England		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101033 Kheruntsyan, Prof Karen V	**Hydrodynamics of quantum fluids** Since the 19th century, the governing equations of classical fluid dynamics or hydrodynamics have been an indispensable tool for transformative applications in aeronautics, medicine, and climate science. However, the applicability of hydrodynamics to the realm of quantum matter and quantum fluids is not well understood. This project intends to fill in this knowledge gap by developing new hydrodynamic theories of quantum fluids formed by ultracold quantum gases. The expected outcomes are the knowledge and theoretical tools required to underpin Australia's advances in quantum technology applications, such as the design of quantum heat engines, control of heat transport in quantum nanowires, and fabrication of new energy efficient materials.	32,400.50	109,658.50	119,615.00	42,357.00	0.00	0.00	304,031.00			France, Spain, Austria, England		
	National Interest Test Statement Hydrodynamics or fluid dynamics is an incredibly successful theoretical framework that underpins our fundamental understanding of flow properties of classical fluids, from oceanic and atmospheric currents to blood flow through capillaries. It also enables us to predict extreme weather events, design aerodynamically efficient aircrafts, and control drug delivery. Unlike classical fluids, however, the applicability of hydrodynamics to quantum fluids is not well understood. This project intends to develop new hydrodynamic theories of quantum fluids that will provide such understanding and fill in this knowledge gap. Quantum fluids or fluid-like states of quantum matter are formed in strongly interacting quantum many-particle systems, and new hydrodynamics theories of such systems have the potential to provide significant benefit to Australia's nascent quantum technology sector: CSIRO forecasts quantum technology could provide $2.2billion revenue and 8,700 jobs by 2030. Project outcomes will enable Australia's growth by providing industries (e.g., defence, health, mining, energy, communications, finance) with the theoretical underpinning and mathematical tools needed to develop and utilise quantum technologies like powerful quantum computers, high-precision sensing and navigation systems, and advanced medical imaging instruments.												
DP240101172 Launikonis, A/Prof Bradley S	**Heat regulation by the fibre types in muscle** Mammals maintain a constant core body temperature by generating heat in resting muscles in response to changes in the environmental temperatures. This project aims to show how the fibre types that make up skeletal muscles regulate heat generation against other muscle function, to maintain core body temperature and the normal movement and posture of the mammal. Project outcomes include defining, for the first time, how heat generation in the muscles of the body is regulated. This should provide critical knowledge of mammalian evolution and ways to manipulate metabolism, which may provide ways to assist with achieving a desired meat quality and yield in beef and other commercially important animals.	94,626.00	187,284.00	186,597.00	93,939.00	0.00	0.00	562,446.00			Canada		
	National Interest Test Statement Mammals, which includes humans and commercially important animals, maintain their body temperature by generating heat in their resting muscles. How the muscle can do this is not clear. Additionally, the process of generating heat in muscles can decline with age. This project will use the latest technology, developed in Australia, to identify how the muscle regulates heat generation and will also identify the key factors that lead to this decline with age. This project will provide fundamental information to potentially manipulate the rate that energy is burned in muscle, providing economic benefit. Beef and pig muscle for human consumption must meet quality standards. Meat quality is affected by fat content and maximizing lean carcass content is desirable for commercial viability. This project will provide fundamental knowledge that could be applied to manage cattle and pigs to burn or maintain fat, as desired, by manipulating the rate of energy use in the resting muscle (energy use by the resting muscle could be manipulated to go up or down, as desired). After significant research into such approaches, such technology may even be useful for weight loss in obese or for elderly people to maintain body temperature. We will publish the new knowledge in scientific and lay format and expect media outlets to also												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	adapt for general audiences. This will promote interest in Australia and the research community to explore the commercial potential in manipulating muscle metabolism.												
DP240101315 Collins, Prof Brett M	**Structure of the essential Commander protein trafficking complex** This project aims to provide a fundamental understanding of the structure and function of Commander, a large protein complex that controls export and recycling of internalised receptors. Commander is highly conserved throughout evolution and is essential for maintaining the homeostasis of hundreds of transmembrane receptors required for cell function and survival, regulating processes as diverse as lipid metabolism and cell adhesion. Despite advances in the understanding of Commander function, little is known about how Commander is assembled and interacts with other essential proteins. This project will use multidisciplinary cellular and structural biology approaches to reveal the architecture of Commander at an atomic level.	124,821.00	253,142.00	218,122.00	89,801.00	0.00	0.00	685,886.00			England		
	National Interest Test Statement This proposal aims to provide a breakthrough in understanding the biology of a protein complex that is essential for normal cellular function and organismal development across species as diverse as humans and single celled amoeba. The immediate impact of this discovery science will be to advance our understanding of the fundamental biological process of membrane trafficking, which is essential for the transport and turnover of cellular receptors and channels involved in lipid homeostasis, cell adhesion, and synaptic function. The project combines state-of-the art technologies, including highly sensitive mass spectrometry and atomic resolution cryoelectron microscopy, and will advance these disciplines and provide cutting edge training for Australian Scientists to enable studies of increasingly complicated protein structures. Membrane trafficking is an emerging target in diseases including infection and neurodegeneration, and in the long term the comprehensive knowledge generated from this project has potential to lead to new genetic approaches or therapeutics that can treat these major health burdens.												
DP240101321 Chuang, A/Prof Kai-Hsiang	**Decoding the brain network of memory formation** This project aims to uncover how the brain network supports the formation of long-lasting memory using cutting-edge imaging, intervention and computational modelling. The project is anticipated to generate new knowledge of the neural activity and circuitry that facilitate memory formation, and targets for modulating network activity and behaviour. This will have significant benefits for neuroscience, engineering and imaging, as well as future applications in humans with technology for detecting, predicting and modulating cognitive performance.	110,083.00	217,947.00	214,823.00	209,654.00	102,695.00	0.00	855,202.00			France		
	National Interest Test Statement This project will determine specific brain network and its activity that facilitate memory formation using cutting-edge multimodal imaging with verification by targeted intervention and computational modelling. The outcomes will advance knowledge in brain science, engineering and imaging fields. It will benefit Australia in several ways. By gaining a comprehensive understanding of the brain circuitry involved in memory formation, this study will enhance our comprehension of this essential cognitive process and provide new opportunities for monitoring and intervening to improve memory. The techniques utilized in this project for decoding brain activity and modulating behaviour have the potential to advance the engineering of brain-computer interfaces. Furthermore, knowledge of the neural activity underlying widely used magnetic resonance imaging techniques will lead to improved precision in human brain imaging. By understanding how neural networks form and store memories, we can facilitate the development of brain-inspired artificial neural network designs and next-generation learning machines. The culmination of these results will provide a foundation for the future development of new devices to detect, predict and improve memory function in children, aging adults, and individuals with dementia. These developments will lead to significant economical, social, and commercial benefits.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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DP240101409 Tartaglino-Mazzucchelli, Dr Gabriele	**Reaching new frontiers of quantum fields and gravity through deformations** This project aims to reach new frontiers in quantum field and gravity theories. These underpin systems ranging from semi-conductors to particle collisions and the quantum behavior of black holes. An obstacle is that these theories are notoriously hard to solve. This project proposes to tackle this longstanding problem by using new deformations, symmetries and dualities that have attracted widespread attention. Expected outcomes will include innovative techniques that will greatly enhance and interconnect our knowledge of field theories and quantum gravity, together with new discoveries in quantum-corrected geometries. A new network of domestic and international experts will largely benefit the fields of theoretical and mathematical physics.	75,539.00	152,408.00	119,051.00	42,182.00	0.00	0.00	389,180.00			United States of America, Italy		
	National Interest Test Statement In the last century, quantum field and gravity theories have been remarkably successful in shaping our understanding of the universe, from its subatomic constituents to cosmological scales. However, the mathematics necessary to unify quantum physics and gravity remains unsettled. Building upon results developed by our team, we will employ innovative ways to deform and solve the equations governing these theories on which Australia's focus has recently seen an expansion. With the recent arrival of new academics from overseas and collaborations with leading scientists in the USA and Italy, the outcomes of this project will forge a new international reputation for Australia in these fundamental fields of research. The long-term progress of this research will help to solve open mysteries of our universe, including understanding the mathematics of quantum gravity, but it is also vital for the development of new quantum technologies in which Australia is largely investing to become a world leader. Additionally, quantum gravity and string theory are hot topics among the general public constantly attracting bright students who often leave to study abroad. Working in universities of major cities and regional Australia, but also in contact with school teachers and local communities, this project aims to inspire and train new generations of homegrown Australian scientists in STEM (Science-Technology-Engineering-Mathematics) areas that will certainly continue to grow.												
DP240101727 Hankamer, Prof Benjamin D	**Structure-guided optimisation of light-driven microalgae cell factories** Every two hours Earth receives more solar energy than is required to power our entire global economy for a year. This project aims to engineer advanced single cell green algae for high-efficiency solar light capture, to power next-generation light-driven bio-manufacture. The significance is to advance industry-scale production of sustainable products using microalgae. This is economically, socially and environmentally beneficial. Project outcomes are designed to advance the technology from high-value bio-manufacture in microalgae, such as pharmaceuticals (e.g. biologicals), to mid-value products (e.g. fine chemicals) through to low-cost products, such as renewable fuels to help deliver key UN Sustainable Development Goals.	125,973.50	270,017.00	280,567.00	136,523.50	0.00	0.00	813,081.00			Germany		
	National Interest Test Statement This project focuses on tapping into the huge energy resource of the sun to power advanced light-driven bio-manufacture and provides economic, commercial, social and environmental benefits for Australia. Every 2 hours Earth receives more solar energy than is required to power our entire global economy for a year. To drive its CO2 emissions down to net zero by 2050, Australia and the broader international community is focused on scaling technology to harness this huge solar resource to generate CO2 neutral electricity (e.g. via photovoltaic systems), fuels (e.g. via renewable fuels) and heat (e.g. via solar thermal). This project advances a new technology front; high-efficiency direct light-driven bio-manufacture using single cell green algae. The knowledge gap addressed by this project is to enhance the efficiency of the first step of the process; light capture. This is economically and												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	commercially beneficial as it advances the technology from high-value bio-manufacture (e.g. large scale pharmaceutical production in microalgae), through to mid value products (e.g. nutritional plant based protein) and low-cost renewable fuels (e.g. sustainable aviation fuels and hydrogen), expanding Australia's economic security and export potential. Social benefits of light-driven bio-manufacture include the creation of significant numbers of high quality, sustainable regional jobs. Environmental benefits include new technologies to deliver Australia's net zero CO2 emissions commitments.												
DP240101772 Lafuente, Dr Ramiro A	**Geometric evolution of spaces with symmetries** Symmetries underpin numerous laws of nature and mathematical constructions. This project aims to develop a comprehensive theory of the famous Ricci flow equation in the presence of symmetries. Previous study of this equation has led to many ground-breaking results, such as Perelman's celebrated proof of the century-old Poincaré conjecture. Outcomes are expected to fill major knowledge gaps in mathematics, opening doors to applications in quantum field theory, relativity and other fields. Anticipated benefits include strengthening Australia's leadership in mathematical innovation, advancing the internationalisation of the Australian research scene, and increasing the involvement of women in STEM.	72,301.00	151,884.00	121,765.00	42,182.00	0.00	0.00	388,132.00			Germany, United States of America, Argentina		
	National Interest Test Statement The project aims to answer fundamental open questions in the overlap of the mathematical fields of geometry and differential equations. Knowledge from these fields provides theoretical underpinning for many areas of science and industry, while results from their overlap enjoy applications in biological modelling, bushfire modelling, image processing and elsewhere. Thus, the outcomes of the project would help lay the groundwork for new technological developments significant to many industries in Australia, such as disaster management, software design and intelligent manufacturing. The project would increase the involvement of women in STEM through advocacy and the provision of a female role model for aspiring researchers. The challenges we intend to address are of prime interest to the international mathematics community. Therefore, the project would help internationalise Australian researcher networks and attract students to Australian universities, thus contributing to the country's economy and intellectual capacity.												
DP240101773 Eisenstat, A/Prof Eric	**Closing the Gap Between Theory and Data in Macroeconometrics** This project aims to bring econometric models (the empirical vehicle for inference) and economic models (the theory) closer together. A new model is intended to be proposed that will address a significant issue with the interpretation of the outputs of the econometric models. As a first contribution, the project is expected to develop the model and an inferential framework for this model using probability theory on manifolds. In a second contribution, it is expected to construct an algorithm to permit inference leading to outputs useful to policy analysts. The model is intended to be parsimonious, which facilitates the development of a time-varying version to allow the model to evolve with the economy and provide better policy guidance.	17,546.00	44,557.00	55,634.00	28,623.00	0.00	0.00	146,360.00					
	National Interest Test Statement Understanding how un-anticipated shocks are transmitted throughout the economy at both the theoretical and empirical levels is crucial to carrying out efficient and effective macroeconomic policy. Australian institutions (eg RBA), inline with best practices worldwide, rely heavily on complex theoretical models to understand transmission mechanisms and policy implications. Unfortunately, the theoretical models are sensitive to assumptions and												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	difficult to estimate, which makes incorporating empirical evidence very challenging. On the other hand, data-driven empirical models are robust to assumptions and provide policy-relevant inference from the data. However, a key assumption of currently existing empirical models greatly undermines their reliability in practice: the number of shocks is assumed to be at least as many as observed variables. This assumption is in fact the direct opposite of what holds in theoretical models, where the number of shocks is always less than the number of variables. By developing a methodology for empirical models with fewere shocks than number of variables, this project will close a tantamount gap between theory and empirics. As such, it will open a new direction for developing empirical policy tools to guide Australian institutions in carrying out better monetary policy, fiscal policy, energy policy, etc. Research outcomes from this project will be promoted beyond academia by organising a workshop that brings together academics and policymakers.												
DP240101783 Nyberg, Prof Bernt D	**Business and democracy: Power, profit and participation** The project aims to explain how business influences democracy. While business and democracy are mutually reinforcing domains in any healthy and vibrant society, there are concerns about the way corporations may unduly influence or even curtail democratic processes. This project expects to generate new knowledge on how industry translates economic power into political influence. This includes the development of a new theory of power and a methodology for examining political connections. This should provide significant benefits to public dialogue and policymakers concerning the task of strengthening citizen voice and decision-making in Australia and globally. **National Interest Test Statement** Trust in Australian democracy has weakened over the last two decades. Part of this erosion of trust stems from the increasing spending on political donations, the growing amount of lobbying, and the movement of individuals between positions of public office and jobs in the same private sector. This influence is not simply corruption, which would be illegal and dealt with through current campaigns for a federal anti-corruption body and political donations reform. Rather, the influence is of a more subtle and unobtrusive nature. This project addresses these concerns by examining how these counter-democratic practices function and providing possible remedies to restore trust in Australia's democracy. This project aims to benefit the economic capacity of Australian industries by safeguarding their legitimacy as well as strengthen civil society through a collaborative effort with industry and government agencies. The research outcomes will be promoted through policy recommendations and submissions of evidence to Governmental inquiries, collaboration with civil society groups, industry, and government agencies by promoting responsive and representative law-making, and active participation in media to strengthen the knowledge used in public deliberations.	45,270.00	107,665.50	113,758.00	51,362.50	0.00	0.00	318,056.00			England, Denmark		
DP240101814 Huang, Prof Zi H	**Embracing Changes for Responsive Video-sharing Services** Video-sharing platforms are a critical information channel for the public. Increasing scale and shifts in user base, with Generation Z now as the dominant user, have resulted in an unprecedented amount of ubiquitous changes in the content and users of these platforms which greatly challenges the responsiveness and quality of the services provided. This project aims to design innovative algorithms to effectively predict and leverage changes, optimise the value of changes, and extract insights from changes for diverse downstream applications of video-sharing platforms. The expected outcomes will create new-generation representation learning techniques, and provide practical tools to amplify the socioeconomic values of video-sharing platforms. **National Interest Test Statement**	81,955.00	168,691.00	175,754.00	89,018.00	0.00	0.00	515,418.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Video-sharing platforms have become an integral part of our daily lives, providing a wealth of information to the public. Meanwhile, ubiquitous changes in how the video content is presented, how the users are engaged, and how the interactions between users and content evolve, have arisen partly attributable to the fact that Generation Z has now become the major user community of those platforms. Representation learning, the backbone technique behind multiple downstream applications of video-sharing platforms, is hence challenged in its responsiveness when faced with constant changes, whereas existing solutions only passively adapt to changes and are suboptimal. This project aims to leap from the mere adaptation to changes to effectively leveraging changes, predicting changes, optimizing the value of changes, and ultimately extracting insights from changes for diverse downstream applications on VSPs in a proficient manner. The expected outcomes of this project are a series of new responsive representation learning methods that can proactively embrace the changes at the content-, user-, and interaction-level, which will generate new knowledge in the intersection of data mining, machine learning, and data management. Furthermore, this project will integrate all technical components into a unified framework, which will not only benefit the users of video-sharing platforms, but also contribute to the development of a more change-resilient, enjoyable, and secure online environment.												
DP240101902 Bernhardt, Prof Paul V	**Emergent organocopper complexes as robust catalysts for electrosynthesis** The capture and stabilisation of highly reactive chemical species is critical to making advances in the synthesis of novel materials, agrochemicals and pharmaceuticals. Metal-bound carbanions are essential components of carbon-carbon bond forming reactions. This project aims to develop an unprecedented family of copper catalysts and deliver an innovative and versatile chemical reactivity platform. Expected outcomes of this project include methods of tempering and unleashing the high reactivity of these species by controlling the oxidation state of the copper ion. Benefits of these outcomes include fundamental understanding of the reactivity of a new class of copper complex that has potential commercial applications in catalysis.	84,864.00	168,794.50	176,054.50	92,124.00	0.00	0.00	521,837.00			Spain		
	National Interest Test Statement The pursuit of innovative chemical technologies for the efficient preparation of pharmaceuticals, plastics and pesticides is demand-driven by society. All practitioners of synthetic chemistry rely on a toolbox of methods to produce chemicals that feed commodity supply chains and Australia's economy. The formation of bonds between carbon atoms is central to these chemical syntheses and requires carefully chosen methods to bring together typically unreactive components to form new chemical bonds selectively and rapidly. Reactive carbanion species play a fundamentally important role as building blocks in chemical production as they lead to new carbon-carbon bond formation, but they are highly sensitive, difficult to stabilise and decompose in the presence of water, which limits their application. Breakthrough research by the applicants has revealed a new way to overcome this stability problem using copper as a reaction partner. The proposed research using electrical current instead of chemical reagents opens new frontiers in catalysis, which offers novel routes to materials and bioactive molecules, while focusing on lowering energy consumption and limiting environmental impact. Achievement of the goals in this application will maintain an Australian competitive edge in this new research area and open longer term opportunities for applications in the industrial synthesis of fine chemicals.												
DP240101968 Carroll, Prof Timothy J	**Subcortical control of human reaching?** This project will test a radical new hypothesis about how the human brain generates visually guided behaviour. Conventional thinking assumes that visuomotor control of limb movements occurs exclusively within the cerebral cortex. However, the project team's recent observations of extremely rapid visually guided muscle activity strongly imply that the human brain controls reaching movements via more primitive midbrain and brainstem structures. The project's hypotheses challenge long-standing ideas about the functional organisation of the human brain and may have wide-ranging implications for the design of human-machine interfaces as well as training protocols in	82,698.50	168,012.50	178,643.00	93,329.00	0.00	0.00	522,683.00			United States of America, Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	rehabilitation, industry, and sport. **National Interest Test Statement** Accurate visually-guided body movements are crucial for success in industrial, defence, sport, and health settings, so knowledge about how the brain produces these behaviours has potential for wide-ranging application. The cerebral cortex, which is the newest part of the brain in evolutionary terms, is currently assumed to directly control visually guided limb movements in humans. However, more primitive animals, such as frogs and fish, are capable of impressive vision-to-motor performance despite lacking this brain structure. This project tests the exciting hypothesis that primitive parts of the human brain are important for producing visually guided behaviour. Outcomes stand to revolutionise thinking about the most fundamental principles of human vision-to-motor behaviour and, by extension, the basic organisational principles of the human brain. The work is especially relevant to tasks that require fast reactions (e.g. sport), and tasks that seek alternative sources of inputs to muscles that do not rely on the motor cortex (e.g. rehabilitation). Thus, the knowledge derived from this project should benefit Australia by advancing multiple scientific fields, and by opening avenues to revolutionise best practice across many real-world settings.												
DP240102085 Chappell, A/Prof Keith J	**Hyperactive endogenous retroviruses and their impact on the koala genome** Koala populations are in steep decline with the ubiquitous koala retrovirus (KoRV) strongly linked with disease. KoRV and other less studied endogenous retrovirus (ERVs) are extremely active within the genome of koalas to a level never observed in any other vertebrate genome. This study will map ERV integration sites within koalas from across their geographic range country and use long-read genomics approaches to understand the link between KoRV and other ERVs, the impact on koala caused by dramatic genomic rewiring, and the mechanisms of genomic immunity which supress ERV activity and mitigate disease. Findings will provide insights into the ongoing arms race between virus and host and inform conservation of an iconic species. **National Interest Test Statement** Koala populations are in steep decline with the ubiquitous koala retrovirus (KoRV) strongly linked with disease. KoRV and other less studied endogenous retrovirus (ERVs) are extremely active within the genome of koalas to a level that has never been observed in any other vertebrate genome. The origin of KoRV, how it is linked to the activity of other ERVs and the impact of dramatic genomic rewiring are all currently unclear. This study will map ERV integration sites within koalas from across the country and use genomics to uncover the origins of KoRV and understand the ongoing arms race between virus and host. Findings will provide insights into retrovirus evolution and inform conservation of an iconic species.	94,672.00	211,145.50	202,093.00	85,619.50	0.00	0.00	593,530.00			United States of America		
DP240102097 Vetter, Prof Irina	**Defining a new family of sodium channel accessory proteins** Voltage-gated sodium channels are key proteins that function as multi-subunit complexes to regulate neuronal excitability. The project aims to investigate the structure and function of a novel family of accessory subunits by utilizing a class of toxins, derived from the giant Australian stinging tree, that directly binds to these proteins to modulate sodium channel function. The project aims to generate significant new knowledge on the function of sodium channels as multi-protein complexes. Expected outcomes of this project include development of novel channel-modulating molecules that may have applications as neuroscience tools to address fundamental questions	101,991.00	202,448.50	205,755.50	105,298.00	0.00	0.00	615,493.00			China (excludes SARs and Taiwan)		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	about ion channel function and biology. **National Interest Test Statement** This project aims to improve our understanding of a family of proteins called sodium channels and how these can be manipulated using a new class of compounds derived from native Australian plants. Sodium channels are critical for the function of cells such as nerves, muscle and brain and important in development of pharmaceutical and agricultural products, including common insecticides and analgesics. We have made a recent groundbreaking discovery showing that sodium channels form a functional complex with a family of proteins called the dispanins, which in turn directly bind a new class of compounds we discovered in the venom of the giant Australian stinging tree. These venom-derived compounds alter how sodium channels operate in a completely new way, and we seek to understand this mechanism at the molecular level. Understanding how dispanins regulate the function of sodium channels will provide new directions in development of new generations of pharmaceutical and agricultural agents. These discoveries have the potential of impacting the Australian economy by leading to development of a new generations of safer non-opioid analgesics, as well as new generations of insecticides that can target pests that show resistance to existing products. In addition, the proposed work will train future Australian scientists in an area of significant growth and skills demand.												
DP240102189 Zheng, A/Prof Zuduo	**Safe and efficient eco-driving using connected and automated vehicles** This project aims to solve the paradox of trading off liveability for mobility by simultaneously reducing traffic congestion, vehicle energy consumption, and emission. This project is expected to generate fundamental knowledge and powerful tools on utilising connected and automated vehicles to help individuals become green drivers. Expected outcomes include ground-breaking models capable of holistically optimising traffic efficiency, energy consumption and emission, and innovative control strategies and policies that focus on energy efficiency and environment protection. This research will bring a wide range of substantial national benefits related to mobility, public health, environmental protection, and energy security. **National Interest Test Statement** As the largest consumer of petroleum products, the transportation systems produce over 80% of air pollution in urban areas. Exposure to ambient air pollution increases morbidity and mortality, and is a leading contributor to global disease burden. For the nation's sustainable economic growth, and public and environmental health, it is imperative to mitigate congestion and to minimise energy consumption and emissions. Ironically, as a society we still constantly adhere to the paradox of trading off liveability for mobility. This project aims to develop novel eco-driving strategies for the current and future transportation systems by integrating advanced driver behaviour models and intelligent traffic control methods. Findings from this research will help researchers, policy makers and transport authorities in Australia to plan for optimal integration of connected and automated vehicles and identify appropriate transport management strategies that maximise the productivity of its transport network while minimise its environmental impact. As a 10-second improvement in delay per vehicle would eliminate more than 1.2 million metric tons of CO2 and save 3.3 million barrels of oil annually, impact of this project will be truly extraordinary in fighting against climate change. The developed eco-driving strategies will be tested at RACQ testing tracks and deployed through existing industrial collaborations (e.g., Department of Transport and Main Roads, Queensland).	79,342.00	181,876.00	205,486.00	161,913.00	58,961.00	0.00	687,578.00			United States of America		
DP240102217 Padmanabhan, Dr Pranesh	**Fyn-STEP-Tau axis: the nanoscale mechanisms of synaptic plasticity** This project investigates how brain cells use their molecular machinery to communicate with one another. At the heart of this process lies the synapses, the contact points that connect brain cells. This project will employ an innovative combination of quantitative microscopy techniques, gene knockout mouse models, and advanced computational and mathematical analyses to generate new knowledge on how a crucial set of proteins organises	104,010.00	215,302.00	224,865.00	113,573.00	0.00	0.00	657,750.00			India, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	in space and time to regulate synaptic connectivity. This will provide significant benefits, including molecular-level insight into the inner workings of the brain and interdisciplinary training for students. The expected outcomes include a deeper understanding of brain functions, such as learning and memory. **National Interest Test Statement** The precise mechanisms by which the brain processes and stores information remain unclear. However, there is a large body of evidence that the transmission of information across synapses, the connections between neurons, plays a central role in this process. This project aims to advance our understanding of the synapse at the molecular and systems level using an experimental paradigm linked to learning and memory. In doing so, new computational tools for analysing super-resolution microscopy data will be developed, interdisciplinary collaborations will be fostered, students will be trained in quantitative biology, and Australia's capacity at the interface between mathematics, computation, microscopy, and neuroscience will be strengthened. The project also has the potential to guide the development of brain-inspired artificial intelligence algorithms that could have a significant economic impact. Ultimately, this project has the potential to improve our understanding of what is required for a brain to function in a highly adaptive manner and what goes wrong in diseases that cause synapse degeneration and memory decline, which have a significant impact on society and the economy.												
DP240102254 Cloos, A/Prof Martijn A	**Creating a non-invasive window into the mind** This project aims to create better tools to study the human mind. This project expects to generate new knowledge that can be used to non-invasively image neuronal activity. Expected outcomes include the development of unique new Magnetic Resonance Imaging (MRI) instruments to study neuronal activity in both highly controlled laboratory conditions and in humans, with the spatial and temporal resolution needed to study the neuronal circuitry that drives low and high-level brain functions, i.e., creating a window into the mind. In the future, outcomes from this study could improve our understanding of mental disorders, advance computer brain interface technology, and inspire the next paradigm shift in artificial intelligence. **National Interest Test Statement** It remains a mystery how the cells in our brain give rise to the human mind. Current techniques lack the precision and speed needed to study the cellular circuitry in the human brain. This project delivers new knowledge of the biophysics of the brain. For the first time it will become possible to see how activity in human brain cells generate signal changes in magnetic resonance images. This new knowledge can be translated to human imaging to study the neuronal circuitry that drives low and high-level brain functions, i.e., creating a window into the mind. The resulting technology will help unlock the full potential of Australia's most powerful human MRI instruments, provide lasting benefits for neuroscience, and provide training and career opportunities for Australian scientists in an as-yet non-existent technology. Economic and social benefits are expected through translation into new technologies, such as advances in artificial intelligence, improved computer brain interfaces and other potential new high-tech business ventures.	52,597.50	128,606.50	146,968.50	70,959.50	0.00	0.00	399,132.00					
DP240102291 Blaskovich, Prof Mark A	**Investigations into the antibacterial mechanism of action of cannabidiol** Cannabidiol (CBD) comes from a set of naturally occurring compounds, with a range of applications in mainstream culture. We have recently reported that CBD has excellent antimicrobial properties, with the ability to kill bacteria. This project aims to understand how CBD works by examining CBD-bacterial interactions at a genetic and molecular level. By understanding how CBD acts on and	121,294.00	211,337.00	174,854.50	84,811.50	0.00	0.00	592,297.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	within bacterial cells, we can create fundamental new knowledge that could lead to the design of improved analogs of CBD to that can treat bacterial infections. As a much-needed completely new antibiotic class, this will lead to significant benefits, supporting Australia's National Strategy to combat the challenges posed by antimicrobial resistance. **National Interest Test Statement** Antimicrobial resistance is a critical global economic and health threat with substantial impacts on the Australian environment, population, and economy. Through Australia's National Antimicrobial Resistance Strategy (2020 and beyond), the Australian Government identified that a strong collaborative research agenda across all sectors is needed, specifically to support the translation of research findings into new approaches and applications. This proposal will address this by expanding our fundamental knowledge of how organisms evade antibiotics and apply this to design a new class of improved antimicrobials for animal and environmental use. This project will develop new tools to investigate mechanisms of action, train researchers on advanced methods including DNA sequencing, potentially leading to new intellectual property, patents, and commercial outcomes.												
DP240102315 Qiao, Dr Ruirui	**Bio-inspired Nanoparticles for Mechano-Regulation of Stem Cell Fate** Mechanical stimulation plays a critical role in regulating stem cell fate. Nanostructure-mediated mechanical cues can precisely stimulate stem cells, but predicting their impact on stem cell differentiation is challenging. This project aims to engineer nanostructures to regulate stem cell fate and gain a fundamental understanding of the mechanical properties that affect cell function. The expected outcomes and benefits of this project include a new fundamental understanding of the effect of mechanical properties on cell function, novel insights into the regulation of stem cell fate, and the development of a new class of roughness-tunable materials suitable for use in tissue engineering and pharmaceutical applications. **National Interest Test Statement** Nanotechnology and material engineering hold significant potential for Australia's multibillion-dollar pharmaceutical industry, particularly in the field of stem cell research. By combining nano/microtechnology, material engineering, and stem cell regulation, it is possible to develop particle-based materials with novel properties for the stem cell industry. This project aims to leverage recent advances in bio-mimicking materials to create innovative nanostructures with customisable roughness. The main objective is to contribute new knowledge to the development of safe, cost-effective, and widely available stem cells for diverse biological applications. Moreover, the project seeks to establish new design principles for engineering materials that can regulate stem cell behaviour, while also providing advanced materials for future tissue engineering applications. This project will enable Australia to expand its expertise in bioengineering and biotechnology, positioning itself at the forefront of bionanotechnology. The outcomes of this research will be of significant benefit to the pharmaceutical industry that relies on stem cell research, as well as the broader scientific community. By developing innovative materials for stem cell regulation and tissue engineering, this project has the potential to contribute to the development of new therapies for a range of diseases and medical conditions, which can ultimately improve the quality of life for people worldwide.	93,791.00	187,767.00	187,152.00	93,176.00	0.00	0.00	561,886.00			United States of America		
DP240102371 Bennett, A/Prof Sarah B	**Legitimacy and effective policing responses to domestic and family violence** Domestic and Family Violence is a problem of epidemic proportions. This project aims to significantly improve police legitimacy and effectiveness by examining for the first time how capacity, police capability and conducive police culture operate individually and interact collectively to inform practice and survivor outcomes. Expected	75,992.50	170,671.50	181,413.00	86,734.00	0.00	0.00	514,811.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	outcomes include the delivery of robust empirical evidence derived from new theoretical and methodological approaches on how these critical factors intersect collectively, and a comprehensive practice framework that identifies the tipping point of critical components for effective responses. The expected benefit will be improved policing responses to domestic and family violence nationally and internationally. **National Interest Test Statement** This research project addresses a national priority to end violence against women and children in Australia in one generation. Violence in the context of intimate and family relationships can have devastating and long-lasting effects on survivors including death. This crime has substantive social, economic, and cultural burdens and costs Australians over $32 billion annually. Despite academic, political and media attention, efforts to reduce Domestic and Family Violence (DFV) have been largely ineffective. Across the previous two decades, rates of domestic and family violence remain high despite decreases in every other major crime type. As first responders, police have a significant opportunity to prevent and reduce DFV, however police currently lack legitimacy and effectiveness in their response to domestic and family violence. This project aims to deliver robust empirical evidence for how capacity, police capability and conducive police culture operate individually and interact collectively to create effective practice. Findings will include a depth understanding of factors that facilitate effective police responses and will be used to create an evidence-based practice framework for law enforcement, the justice system and support services. Adoption of this framework will strengthen police legitimacy and effectiveness and the justice system's capacity to deliver comprehensive, coordinated and person-centred responses for the benefit of all Australians.												
DP240102384 Suarez, Dr Rodrigo	**Connectomes arising: linking structure and function in neocortical wiring.** The cerebral cortex underpins human cognition, yet exactly how it becomes connected is unknown due to a lack of live developmental assays. We overcome this using prematurely born marsupials, which allow to study cortical development from embryo-like stages with remarkable resolution. This project will study how neural activity arises as the first connections are formed, and link functional and structural networks across development in vivo. Experimental manipulations of activity, and computational models will discover developmental rules for precise wiring of cortical connections. Benefits include new methods to study cortical development, and outlining electrical, molecular and neuroanatomical signatures of early mammalian brain formation. **National Interest Test Statement** Correct formation of brain connections is essential for a healthy start of life. However, as this occurs prior to birth, very little is known about the mechanisms of healthy or pathological wiring of circuits in the cerebral cortex, since conventional species like rodents cannot survive outside the uterus, and non-mammals like fish do not have a cortex. Here we exploit the extremely underdeveloped birth of marsupial mammals to unravel these questions using advanced methods of gene-manipulation, live microscopy, magnetic resonance imaging, and computational modelling. Beyond advancing fundamental knowledge in developmental, evolutionary and computational neuroscience, this project will create new capabilities in genetics, optics, instrumentation and computing technologies. Short-term benefits range from new experimental assays to pioneer the study of live cortical formation, developing new computational models and machine learning methods to study the dynamics of complex systems, and establishing new biological signatures of healthy brain development from stages equivalent to mid-human gestation. All experiments of this proposal are designed to generate results that can be used as pilot data to further develop applications of commercial interest. These might include manufacture of advanced scientific software and instruments, and refinement of emerging technologies with a wide range of applications such as network modelling, pattern recognition, and brain-machine interfaces.	75,985.50	187,855.00	222,522.00	110,652.50	0.00	0.00	597,015.00			Israel, United States of America		
DP240102385 van Swinderen, Prof	**Quiet sleep is for repair, active sleep is for learning** Sleep is thought to achieve many different functions, from brain waste clearance to regulating emotions and	82,327.00	164,516.00	164,378.00	82,189.00	0.00	0.00	493,410.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Bruno	perception. Understanding sleep functions in animal models has been difficult because sleep has been typically reduced to a single state. Our discovery of distinct sleep stages in the fruit fly provides a powerful way to study how different conserved sleep functions are regulated. This project will use new strategies for manipulating sleep stages in flies to understand their respective physiology and functions. We will test our hypothesis that different categories of sleep functions have been segregated by evolution into different stages: a quiet stage concerned primarily with brain repair and an active stage important for learning.												
	National Interest Test Statement												
	Sleep is essential for survival in all animals. However, we do not fully understand why sleep is restorative for the brain, nor why sleep functions seem to be segregated between different sleep stages. This project aims to investigate these questions in a simple animal model, following our discovery that even flies sleep in distinct stages like humans. This is of major relevance to Australia's national interest because sleep influences most aspects of our lives, including basic health and learning. The economic cost to Australia of inadequate sleep is over $20 billion, not counting the costs associated with loss of wellbeing. Improving sleep based on a better scientific understanding of basic biological sleep functions that have been evolutionarily conserved from flies to humans will lead to novel strategies for improved productivity and healthier ageing. In the longer term, translation of these discoveries into practice could occur through partnering with the pharmaceutical industry to test and develop a new generation of compounds tailored to deliver specific sleep functions, such as those investigated in this project proposal. Our work will also provide a better understanding of how evolution has solved the fundamental problem of simultaneously repairing a brain while maintaining its capacity for learning. This will promote biologically-inspired platforms for designing optimised artificial systems that will increasingly need to work more like real brains.												
DP240102418	**Molecular mechanisms that regulate the kinetics of neurotransmitter release**	86,514.00	173,028.00	175,728.00	178,528.00	89,314.00	0.00	703,112.00			United States of America		
Hu, A/Prof Zhitao	Information processing in the human brain plays important roles in normal behaviour and cognition, most of which require rapid and precisely timed neurotransmitter release. However, the molecular mechanisms that control the speed and timing of this release remain largely unclear. This research project will use a novel mix of electrophysiology, electron microscopy, genetics, biochemistry, and imaging to investigate how the speed of neurotransmitter release is controlled by the most important synaptic protein UNC-13 and its binding partners. This project expects to generate significant knowledge in the area of synaptic transmission. The outcomes will deepen our understanding of neuronal communication and information processing in the brain.												
	National Interest Test Statement												
	Timing is everything in the transmission of signals between neurons in the brain. Many behaviours in human would be severely impaired if their neurons could not communicate accurately. Consequently, factors that alter the timing or kinetics of synaptic transmission play a vital role in shaping behaviour and cognition. By investigating the function of the key synaptic proteins in synaptic transmission, this project aims to uncover the molecular code and mechanisms that govern the speed of neurotransmitter release by using the nematode C. elegans as an excellent genetic model. The generated knowledge by this project will help understand how information is processed efficiently in the human brain so that, with time, it can support the treatment of behavioural and physical disorders such as autism disorder and neuromuscular junction disorder. New research models for cell and developmental biology will be developed, opening new R&D opportunities for discovery and application in areas such as research platforms and technologies, therapeutics and diagnostics.												
DP240102434	**Mineral Biosequestration of Organic Carbon in Early Pedogenesis of Tailings**	88,636.00	191,150.00	190,318.00	87,804.00	0.00	0.00	557,908.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Huang, Prof Dr Longbin	Upcycling tailings into soil (technosols developed from technogenic parent materials) offers a sustainable approach to overcome severe topsoil shortage that limits the progress of ecological rehabilitation of tailings across mine sites. This project aims to establish new knowledge on mineral bioweathering, organic carbon (OC) sequestration in rapidly formed mineral phases, and OC turnover driven by colonising microbes and plant roots, in the early pedogenesis of tailings initiated by inputs of organic and inorganic materials. This new knowledge is required for developing eco-engineering technology adaptable to a wide range of tailings of diverse mineralogy, to achieve sustainable tailings rehabilitation and organic carbon sequestration.												
	National Interest Test Statement												
	Australian mining industry is facing enormous financial and environmental challenges of tailings rehabilitation. In Australia, more than16,000 ha of tailings storage facilities (TSFs) at operating mine sites require ecological rehabilitation, but it is limited by severe shortage of natural soil resources. Natural soil-based rehabilitation approach to rehabilitate TSFs is financially and environmentally unsustainable, due to expensive costs and limited accessibility to supply soil sources (c.a. $50-120 per cubic M soil) and the need to rehabilitate offsite landscapes excavated to supply large volumes of soil. This project aims to understand the mechanisms of mineral weathering driven organic carbon biosequestration in the early phase of engineered pedogenesis of tailings, in order to overcome the soil shortage barrier. The knowledge about mineral weathering driven organic carbon sequestration enables adaptive integration into ecological rehabilitation of different tailings. This knowledge will help to develop game-changing technology to treat and upcycle ferrous and base metal mine tailings into resilient soil (or technosols) in situ, for sustainable rehabilitation of many TSFs nationwide. This new approach not only offsets the need for natural soil resources, but also offers organic carbon sequestration and storage opportunities through enhancing mineral sequestration and protection in technosols eco-engineered from tailings.												
DP240102458 Fenlon, Dr Laura R	**How does embryonic physiology shape the divergence of brain development?** Unlike placental mammals (humans, mice, dogs etc) marsupials give birth to very immature young that finalise development in the pouch. Despite this remarkable distinction in the major mammalian lineages, very little is known about how differing reproductive environments impact development and evolution. This project aims to explore how developing inside or outside a uterus impacts brain development in placental vs marsupial mammals. Expected outcomes include expanding theories of how different body systems are connected in development and evolution, understanding what aspects of marsupial development might be especially sensitive to variations in environment brought about by climate change and enhancing Australia's research capabilities.	50,863.00	164,614.00	219,984.00	181,597.00	75,364.00	0.00	692,422.00			Switzerland		
	National Interest Test Statement												
	Almost all of Australia's native species are marsupials, meaning that they have a unique reproductive strategy of giving birth to remarkably immature young that finalise development in a pouch. In contrast, placental mammals (humans, mice etc) undergo major stages of formation, such as brain development, inside the uterus. It is currently unknown how marsupials manage to develop functional brains after birth. This project aims to address this question, and expects to benefit Australia by achieving a better understanding of our native wildlife, especially how brain development while exposed to the environment might be sensitive to challenges like climate change. This knowledge could eventually help to inform Australian wildlife conservation strategies and policies, as well as diagnoses and treatments of insults such as hypoxia and metabolic disease during human pregnancy, which are known to impact brain development. It should also enhance Australia's capabilities in this research sector by using state-of-the-art techniques and our unique diversity of native marsupial mammals to advance evolutionary												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	neuroscience research.												
DP240102502 Bialkowski, Dr Konstanty	**Practical multi-receiver passive radar with low-cost synchronisation** This project aims to address the current challenges of developing practical multi-receiver passive radar systems, through the development of advanced receiver synchronisation techniques, which do not require the deployment of costly infrastructure. The project will develop novel algorithms and techniques that enable synchronous combining of data from multiple radars, allowing for the detection of smaller targets and significantly extending the radar coverage zone. The expected outcomes of this project include improved performance of passive radar systems and the advancement of radar technology. The benefits of this project include new applications in areas such as traffic monitoring, drone detection and national security.	89,686.00	178,584.00	180,947.00	92,049.00	0.00	0.00	541,266.00					
	National Interest Test Statement Passive radar systems play a crucial role in defence and enable situation awareness while operating silently. Typically, passive radar can have significant cost advantages due to not needing a transmitter. However, to unlock the full advantages, a multi-receiver radar network is required. This increases the coverage and also enables the detection of smaller targets. Due to this reason, multi-receiver passive radar systems are rare and impractical due to the need for distributed infrastructure to unlock the full capabilities of passive radar. This project will focus on developing advanced receiver synchronisation techniques and enabling practical implementations of multistatic radar systems. The potential outcomes of this project include the ability to detect smaller targets, and improved radar coverage, leading to new applications in defense, drone detection and traffic monitoring. The development of receiver synchronisation techniques that do not rely on fixed infrastructure will ensure that they are robust and cheaper to deploy, making the technology accessible to a wider range of uses. Advances will be rapidly deployed through existing industrial collaborations and licensing of emerging technologies, ensuring rapid uptake of new technologies. Hence this will support the growth of the Australian radar industry, both in defence as well as commercial areas. New job opportunities in Australia will ensure that Australia remains at the forefront of advanced radar technology.												
DP240102506 Khromykh, Prof Alexander A	**From shape to function: how structured RNA defines insect flaviviruses** The goal of this project is to obtain an understanding of how insect-specific flaviviruses (ISFs) utilise viral noncoding RNAs to enable their replication in mosquitoes. These viruses only replicate in mosquitoes, and not in humans or animals. They can be employed as the biocontrol agents for mosquito-borne diseases as they make mosquitoes incapable of disease transmission. However, it is currently unknown how exactly insect-specific flaviviruses affect mosquitoes and this information is vital for informed design of ISF-based interventions. The project will generate new knowledge on functions of noncoding RNAs in ISFs that are hypothesised to have immunomodulatory role in mosquitoes. It will also train students and ECRs.	115,748.00	230,264.50	202,005.50	87,489.00	0.00	0.00	635,507.00			United States of America		
	National Interest Test Statement Flaviviruses transmitted by mosquitoes pose a substantial burden for Australian primary industries. In 2011, over 1000 horses had to be euthanised due to infection with Kunjin virus. Moreover, the crocodile skin industry in												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Australia is estimated to lose >AU10 million per year in skin value due to the lesions caused by Kunjin infection. In addition, last year 50 pig farms in Australia were affected by the outbreak of Japanese encephalitis. Currently no vaccine or treatment are available for these viruses. However, their spread can be reduced using biocontrol strategies. One of the promising emerging biocontrol methods for flaviviruses employs insect-specific flaviviruses (ISFs), that infect mosquitoes, but cannot be transmitted to or replicate in vertebrates. ISFs make mosquitoes incapable of being infected with and transmit pathogenic viruses. However, it is currently unknown why they affect mosquitoes in this way and the mechanisms of their interactions with insect host have been poorly studied. This knowledge is important for the safety and efficacy of ISF-based interactions. While outside of the scope of this proposal, knowledge generated in this study may benefit Australian economy by informing future design of ISF-based flavivirus biocontrol strategies.												
DP240102549 Kopittke, Prof Peter M	**Role of nitrogen-rich compounds for increasing carbon sequestration in soil** This project aims to unravel how increasing concentrations of nitrogen-rich compounds in soils can potentially increase our ability to sequester soil organic carbon. This is significant because long-term agricultural production greatly reduces soil organic carbon stocks and releases carbon dioxide as a greenhouse gas. Expected outcomes of this project include providing information that is urgently needed to develop predictive carbon models for effective policy-making and improved management. This project should provide substantial benefits, including fulfilling the carbon sequestration potential of Australia's soils, thereby delivering positive economic outcomes through increased farm-gate output and mitigation of climate change. **National Interest Test Statement** This research aims to deliver major conceptual breakthroughs of how soil organic carbon behaves. Soil organic carbon is recognised by the Australian Government as one of six "priority low emissions technologies" for lowering greenhouse gas emissions. This project will further encourage Australian farmers, agriculture industries, and agricultural consulting agencies to adopt best-management practices. In Australia's Long-term Emissions Reduction Plan (2021), 'soil carbon' is identified as having the potential to provide at least 17 Mt CO2 equivalent of accredited offsets in 2050 earning landholders $400 million in additional revenue. This proposal will directly address key Science and Research Priorities in the Soil and Water sector through improving the understanding of sustainable limits for productive use of soil. The outcomes of this project can be used to enable better land management to enhance organic carbon storage in soils and mitigate climate change. More broadly, successful realisation of this project will supply options for responding and adapting to the impacts of environmental change on biological systems, urban, and rural communities and industry.	87,063.00	183,328.00	198,720.00	102,455.00	0.00	0.00	571,566.00			France, Germany		
DP240102584 Gerlach, A/Prof Heiko	**Privacy, Data Protection and Market Structure** The rise of the digital economy has led to an unprecedented scale of data collection, storage and processing, creating new privacy risks for individuals. This project will provide an economic analysis of the incentives and institutions necessary to ensure data is sufficiently protected while also providing adequate levels of privacy to individuals. It will do this by exploring the optimal design of privacy laws, data breach notification laws, and the relationship between promoting competition and encouraging data protection investment. The outcomes of this research will contribute to the efforts of the federal government to build a secure and resilient digital infrastructure that supports the entire Australian knowledge economy. **National Interest Test Statement**	28,570.50	57,291.00	54,011.50	25,291.00	0.00	0.00	165,164.00			United States of America, England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Recent high-profile data breaches in companies such as Telstra, Optus and Medibank have exposed the increased privacy risks of data collection and storage in Australia. While the productivity potential of a resilient digital infrastructure is immense, the incentives of providing protection against unauthorized use of data are not well understood. This project aims to fill this gap and proposes an economic analysis of incentives and institutions to protect data and privacy. This research develops novel model frameworks to improve our understanding of the interaction between data protection, breach notification and market structure. Our project will generate new knowledge to design privacy laws and data breach notification laws that foster investment in data protection. The analysis will also identify market structures and industry characteristics in which data protection is more likely to be weak and might require specific regulation. This research will benefit Australia economically and socially, by potentially avoiding huge financial losses caused by data breach vulnerabilities, by encouraging investment in the digital economy, and by promoting the privacy of individuals.												
DP240102682 Abbosh, Prof Amin	**Next-Generation Solvers for Complex Microwave Engineering Problems** This project aims to design a complementary physics-guided, data-driven method that can accurately solve complex microwave engineering problems in a timely manner. The primary bottleneck so far preventing that approach, which is the disparity between the trained theoretical model and reality, will be overcome using a multi-frequency complex-valued domain adaptation technique. The method will use deep neural networks to reliably learn the physical concepts of microwave engineering problems. This project will have significant economic and societal benefits, such as supporting the efficient design, installation and operation of communication systems, mining, infrastructure inspection, security, remote sensing, and microwave imaging.	86,526.00	178,552.00	184,052.00	92,026.00	0.00	0.00	541,156.00			Singapore, Israel		
	National Interest Test Statement The proposed project aims to develop a solver for complex electromagnetic problems using deep learning techniques. This project is relevant to the national science and research priorities for advanced manufacturing in Australia. The developed solver has the potential to bring numerous benefits to the country, including new knowledge and technologies, economic and social benefits, and promoting national and international collaborations. The proposed solver can be applied to a wide range of industries, including aerospace and defence, communications, surveillance, mining, biomedical imaging, etc. It can help reduce development time, the cost of physical testing, and the risk of not meeting compliance requirements in these industries. Additionally, the project will open a new view of understanding real-life electromagnetic problems and promote Australia's international research competitiveness and reputation. The CIs and PI of this project have established relationships with many Australian and international companies in microwave engineering and have a strong track record of driving research from fundamental to translation. This project has the potential to contribute significantly to the Australian economy and enhance multidisciplinary collaboration between microwave engineering and computer science communities to solve complex real-life challenges.												
DP240102774 Becker, A/Prof Stefanie I	**Can the Relational Account predict search in multiple-element displays?** This project provides evidence of a novel mechanism that guides visual attention. Our results confirm the existence of a mechanism that can rapidly and automatically assess the dominant feature(s) in a visual scene and radically change how attention is tuned to a target object. Moreover, this attention-guiding target template can change systematically as observers search through different items in visual search, possibly due to a re-shaping and narrowing of the target template. These are both ground-breaking discoveries that have not been described before. Work on this project promises to lead to important theoretical breakthroughs, resolve current	32,105.00	63,926.00	70,092.00	113,260.00	74,989.00	0.00	354,372.00			United States of America, England, Germany, Switzerland, Austria		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	discrepancies in the literature and advance methods of Cognitive Psychology and Neuroscience. **National Interest Test Statement** How do we perform in a visual search? Current theories of attention maintain that we tune attention to the known features of a target object (e.g., to 'orange' when we are looking for an orange), which allows us to selectively attend to items with this feature. Moreover, it is currently believed that the visual system inhibits the location of attended items to prevent revisiting already inspected items ('inhibitory tagging'), and ensure that we will eventually find the target. By contrast, our results show that the visual system rapidly and automatically assesses the dominant features in the visual field to tune attention to either to veridical or non-veridical features of the target (e.g., reddest or yellowest), depending on the context. Moreover, re-visiting already inspected items is prevented by systematic changes in the way attention is tuned to the target, to exclude certain features (e.g., red). These are both ground-breaking findings that have not been described in the literature before and promise to revolutionise current theories of attention and our understanding of visual search. This should be of broad public interest, as visual search is one of the most frequent activities of everyday life. The results of this project will also yield a more accurate description of the factors causing distraction and errors, which are still the most frequent causes for mishaps and accidents. Hence, the project can also help to inform policy-makers to create safer environments.												
DP240102888 Hume, Prof David A	**A macrophage-centric holistic view of postnatal development** The immediate postnatal period in mammals is crucial for survival, long term health and productivity. It is also a time when animals are especially susceptible to infectious disease. This project aims to investigate how cells of the innate immune system called macrophages control somatic growth and development of mature organ function in the early postnatal period. The project aims to build upon investment in new animal models and a novel discovery to generate significant new knowledge that challenges current concepts of mammalian growth control. The outcomes will enhance Australia's international reputation in the fields of physiology, immunology and developmental biology and may translate to improvements in health in animals and humans.	144,509.00	292,518.00	293,018.00	145,009.00	0.00	0.00	875,054.00			Scotland		
	National Interest Test Statement This project is concerned with the processes required for a newborn animal to adapt to life outside of the womb. The project is based upon the novel observation that postnatal expansion of the innate immune system is required for normal growth and maturation or organ function. Immune fitness has been recognised as a trait in both humans and livestock, but the link between the immune system and normal postnatal development has not been appreciated previously. We aim to understand precisely how innate immune cells regulate postnatal growth and development. Australia is a major livestock producer and exporter. Genetic and genomic selection has greatly improved the lifelong productivity and efficiency of major livestock species but at some cost to resilience. Postnatal mortality and/or failure to thrive and remains an important issue with significant economic impact as production systems become more intensive in the face of an adapting global climate. Resilience is even more essential in developing countries where small-holder production systems are a key path out of poverty. This project will identify mechanisms and target genes that form the basis for selection for fitness and in humans, for possible interventions to improve newborn livestock and infant health.												
DP240102956 Bowles, A/Prof Josephine	**Foundations of a good egg: correctly transitioning from mitosis to meiosis** Production of viable offspring is essential to the survival of any species. In all sexually reproducing species, this requires a unique cell type, the germ cell. Germ cells undergo a special type of cell division, called meiosis, so that they can eventually produce gametes (sperm in males and eggs in females). This project aims to discover how germ cells halt the standard form of cell division, called mitosis, and initiate meiotic division instead. It is	135,084.50	273,047.00	269,695.00	131,732.50	0.00	0.00	809,559.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	important to understand all the fundamental processes that occur during normal germ cell development so that, in the future, we can use this knowledge to support agricultural advances, rescue endangered species and solve human problems such as infertility and genetic disease. **National Interest Test Statement** Germ cells are the precursor cells of gametes (eggs and sperm) and are, therefore, critical for the very survival of all sexually-reproducing species. In this project we focus on the mechanisms that underlie meiosis, a special type of cell division specific to germ cells and crucial for production of the gametes. Currently, we have very little idea what mechanisms trigger the change from mitosis (cell division process used by all cells) to meiosis (cell division that is specific to germ cells). Understanding the mechanisms that control meiosis in germ cells during normal life will put us in a position to reproduce this process in vitro - possibly eventually it will be possible to generating artifical gametes. Expected outcomes will inform future efforts to control fertility and infertility in livestock and other mammalian animals (e.g. pets and endangered Australian species). Outcomes are also likely to advance fundamental knowledge in the disciplines of reproductive biology and developmental biology.												
DP240103068 Bai, A/Prof Guangdong	**Rigorous Privacy Compliance in Modern Application Ecosystems** Modern network applications such as mobile applications and browser extensions have become the primary gateways for consumers to access the Internet in today's digital landscape. This project aims to address privacy issues in these ecosystems by developing a new privacy-compliance assessment framework. The framework will evaluate the current privacy practices of application ecosystems, enabling users and developers in Australia and worldwide to reliably identify potential privacy risks and issues on their applications. The intended outcomes should endow data controllers with the capability of evidencing their compliance of data protection legislations such as Australia Privacy Act 1988 and EU General Data Protection Regulation (GDPR). **National Interest Test Statement** The Australian government is committed to establishing a thriving digital economy as a means of facilitating economic recovery in the post-pandemic era. Networked applications, as the primary gateways to this digital economy, play a critical role in the modern internet. The stringent data protection regulations around the world, such as the EU GDPR, present a challenge for Australian businesses that handle user data. This project aims to develop science and technology to address the core challenges of privacy-compliant data handling in various application ecosystems. It will deliver innovative approaches that satisfy the requirements of privacy, resilience, and energy efficiency, while ensuring data utility. This effort will contribute to Australian Science and Research Priorities by providing highly secure and resilient communications, as well as data acquisition, storage, retention, and analysis for government, defence, business, transport systems, emergency and health services. This endeavour will significantly enhance the field of privacy compliance and fully unlock big data-powered applications for Australian businesses.	80,935.00	164,370.00	169,370.00	85,935.00	0.00	0.00	500,610.00			United States of America, Singapore, England		
	The University of Queensland	3,222,723.50	6,752,648.00	6,657,717.00	3,529,115.50	401,323.00	0.00	20,563,527.00					
University of Southern Queensland													
DP240102230 Dinh, Dr Toan K	**Thermal engineering in semiconductor heterojunction for space transducers** Microelectromechanical system (MEMS) transducers,	77,794.50	156,589.00	158,089.00	79,294.50	0.00	0.00	471,767.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	including sensors and actuators, are essential for space applications. However, MEMS transducers have not yet provided compelling performance for the space industry as they typically experience degradation of performance when subjected to elevated temperature and radiation. This research aims to develop an innovative transducer technology that uses a temperature gradient to enhance performance and a radiation-hard material to ensure reliability and longevity. Expected outcomes include improved understanding of transducer performance under temperature gradient, appropriate material selection, and design recommendations for high-performance transducers with applications in space and defence.												
	National Interest Test Statement												
	Australia is developing new manufacturing opportunities in the space sector, and there are many opportunities to develop and deploy innovative and robust instrumentation and transducers, particularly for the manufacture of small satellites. Current sensor technology based on silicon semiconductors are not robust for use in space. This project will develop a new class of sensors based on silicon carbide on silicon, which will resist radiation and the extreme environment of space. We will utilise national microfabrication facilities to manufacture radiation-resistant transducers for space applications. This semiconductor technology is of interest to the global space industry, and materials development for the space sector and satellite manufacturing and deployment are anticipated to deliver nearly $1billion in economic benefit to the Australian economy by 2030. The team will work with the iLAuNCH Space Trailblazer, hosted by the University of Southern Queensland, to communicate these findings to the space industry and will seek to partner with a relevant industry partner and participate in the iLAuNCH Space Accelerator to commercialise this technology.												
DP240102329 Wen, Prof Peng (Paul)	**EEG Based Global Network Models and Platform for Brain States Assessment** This project aims to generate new knowledge and tools in global brain network modelling and deep learning technology. It addresses the significant issues in higher brain function state assessment using brain signal EEG. The project applies global brain networks to model brain dynamical activities as a whole, and assesses higher brain functions such as consciousness, fatigue, sleep, stress and depression, and their step by step evolution in real-time using innovative deep learning approaches. The expected outcomes are optimised brain network models and a platform technology. The intended results can be applied to greatly improve the sleep quality and productivity of general community, and the safety of workplace and transportation.	86,794.50	175,741.50	179,894.00	90,947.00	0.00	0.00	533,377.00					
	National Interest Test Statement												
	This project addresses the real world practical challenges in higher brain function state assessment such as consciousness, sleep, fatigue, stress and depression. It aims to develop a novel platform technology which includes adaptive mathematical models and advanced deep learning approaches that are specific and enable the development of novel real-time consciousness or alertness level monitoring devices using brain signal EEG. The outcomes of the project can be applied to the research and development of new products in (i) stress and fatigue detection in work places and transportation where alertness level elevates the risk of accident, which will prevent injuries and fatalities; (ii) auto depth of anaesthesia monitoring and control system for surgery, which will greatly improve the comfort of patients, reduce doctors' workload and medical cost; and (iii) sleep quality and depression, a growing modern day problem which has been linked to significant economic losses because of decreased productivity and increased absenteeism. This project will, therefore, provide fundamental advances in inferring global brain network models and deep learning algorithms for higher brain function state assessment from multi-dimension brain signal EEG, present great opportunities for commercialisation, and inform government and general community in decision-making and policy development through publications and media engagements.												

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240102628 Song, Prof Pingan	**Bioinspired Ceramifiable Fire-Retardant Composite Coatings** This project aims to design bioinspired, adhesive, ceramifiable fire-retardant coatings through understanding their composition-property relationship and fire-retardant mechanism. The fire-retardant coatings are then applied to typical polymer foams to create fire-safe building thermal insulation materials. This project will generate new knowledge in materials science that helps to expedite next-generation advanced fire-retardant coatings for a variety of flammable substrates. Expected outcomes of this project are cost-effective fire-retardant coatings and fire-safe, inexpensive thermal insulation materials. This project will bring significant economic benefits to Australia and help to create fire-resilient and energy-efficient buildings. **National Interest Test Statement** Heating and cooling account for over 20% to 50% of energy used in homes, depending on climate zones in Australia. The use of polymer foams to thermally insulated roofs and walls represents a cost-effective way to create zero energy and carbon-ready buildings, and the Australia insulation market is over $750 million in 2022. Most polymer foams, however, are highly flammable, so their use has already triggered many building fires, leading to huge losses of life and property. This project will develop advanced fire-retardant coatings for polymer foams to create fire-safe, inexpensive thermal insulation materials via gaining a fundamental understanding of their composition-property relationship and protection mechanism. Key benefits of the project include (i) new knowledge in an in-depth understanding of the coatings and their working mechanism, and design principles for advanced fire-retardant coatings; (ii) strengthening Australia's advanced manufacturing capabilities in coatings and thermal insulation materials; (iii) mitigating building fires; and (iv) creating new job opportunities. The project will help to position Australia as a lead in skills development for the advanced manufacturing sector, support Australia to achieve its emissions reduction targets, and to build a fire-resilient and energy-efficient country. Dissemination of research outcomes via industry conferences and professional journals will create opportunities for commercialisation of this new technology.	89,480.00	182,028.50	184,664.00	92,115.50	0.00	0.00	548,288.00			United States of America		
	University of Southern Queensland	254,069.00	514,359.00	522,647.00	262,357.00	0.00	0.00	1,553,432.00					

University of the Sunshine Coast

DP240101861 Salmon, Prof Paul M	**A new model of teamwork for Human-Autonomy Teams (HATs)** Human-Autonomy Teams (HATs) could potentially enhance most aspects of our daily lives; however, there are key knowledge gaps around HAT functioning and how to achieve optimal HAT performance. This research will apply a novel integration of systems analysis and computational modelling methods to develop, test, and validate a new model of teamwork in HATs. The model will clarify the processes and behaviours that support optimal HAT functioning, delineate HAT performance measures, and help to identify strategies to optimise HAT performance. The outcomes will provide a basis for future HAT research and ensure that the potential benefits of HATs are realised in areas such as defence, transport, healthcare, manufacturing, and disaster response.	90,593.00	177,499.00	211,384.50	124,478.50	0.00	0.00	603,955.00			United States of America		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement Teams play a critical role in society; however, teams and teamwork are changing dramatically due to technological advances such as advanced artificial intelligence. Human-Autonomy Teams (HATs), comprising humans and autonomous agents working together toward a common goal, are increasingly being used in areas such as defence, transport, healthcare, manufacturing, and disaster response, and have the potential to provide significant benefits across society. However, our current understanding of HAT functioning is limited, and existing models of teamwork in human-human teams are no longer fit for purpose. Consequently, poorly designed and inadequately functioning HATs are likely to become problematic in many areas, often with catastrophic outcomes. This research will apply a novel integration of systems analysis and computational modelling methods to develop, test, and validate a new model of teamwork for HATs. In doing so, the research will also produce a simulation platform to support in-silico experimentation on HATs. The new model of teamwork will clarify the processes, behaviours, and supporting mechanisms that enable optimal HAT functioning, delineate key HAT performance measures, and help to identify strategies that can be used to optimise the performance of HATs. The outcomes will benefit both research and practice, providing the basis for future HAT research and ensuring that the many potential benefits of HATs are realised across society.												
University of the Sunshine Coast		90,593.00	177,499.00	211,384.50	124,478.50	0.00	0.00	603,955.00					
Queensland		5,644,832.50	11,934,727.50	11,911,375.00	6,124,929.00	503,449.00	0.00	36,119,313.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
South Australia													
Flinders University													
DP240100555	**New Horizons in Quinonedimethide Chemistry**	100,000.00	200,000.00	200,000.00	100,000.00	0.00	0.00	600,000.00					
Coote, Prof Michelle L	Quinonedimethides (QDMs) are organic molecules with a notorious reputation for instability, hence they are poorly understood and an underexploited resource. This project will unite the ideally suited computational and experimental skills of the CIs to perform the first thorough investigation into fundamental QDM chemistry. It aims to map structure-reactivity in QDMs, investigate their ability to rapidly generate complex structures, and demonstrate their potential in spintronics and other applications. Anticipated outcomes include powerful and general new synthetic concepts, methods, strategies and tactics. This should provide significant benefits, such as better ways to manufacture important medicines and other materials.												
	National Interest Test Statement												
	Chemical synthesis underpins the chemical industry, one Australia's largest manufacturing sectors, contributing more than $38 billion to GDP. It is a key enabler of food and agriculture, advanced manufacturing, medical technologies and pharmaceuticals, and mining. Chemical synthesis is possible because we know something about how to put matter together on the atomic scale. The problem is that we don't know how to do this well, which leads to it being unsustainable, labour and resource intensive, and costly. This project aims to fill a significant gap in our understanding of molecules called quinonedimethides, which have enormous untapped potential for shorter, greener chemical syntheses and new applications ranging from medicines to advanced materials. Significant outcomes and benefits of this work include enhanced capacity in cutting-edge chemical synthesis, and hence accelerated invention of new pharmaceuticals, agrochemicals and other important materials. This project will also benefit Australia by training people in the experimental and computational skills needed by next generation, future high technology industries.												
DP240102137	**Programmable Ferroelectric Nanoelectronics for In-memory Computing**	30,560.00	93,044.50	156,306.00	93,821.50	0.00	0.00	373,732.00			United States of America		
Sharma, Dr Pankaj	The project aims to explore and develop the next-generation ferroelectric memory addressing the energy and speed issues of computers. Modern digital computers are notoriously energy consuming and slow, especially, when performing data-intensive tasks, e.g. identifying images and making decisions. This gap will be bridged by advancing novel ferroelectric quantum memory concepts and prototypes. Expected outcomes include new memory design, material principles and ferroelectric devices capable of not only storing huge amounts of data but also instant fast processing and brain like learning. Project benefits include high performance hardware solutions for Artificial Intelligence and Big data boosting Australian quantum technology and industries.												
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Data-centric innovations are transforming Australia's economy and businesses. It is forecasted to add more than $2 trillion to the Australian economy by 2030. With the explosion of the Internet of Things and smart devices, more and more data generated every day needs to be rapidly stored and classified. Investment, therefore, in innovative data-centric technologies is in Australia's national interest to ensure global competitiveness and build capacity. This project will establish the fundamental science and material principles on which the next-generation data-centric computing technology will be built. The project focuses on a new kind of memory device that not only stores a vast amount of data but also processes it instantly and will thus provide an energy-efficient solution for data-intensive applications, e.g. Artificial Intelligence and big data. This project is at the cutting edge of data-centric computing research and is a critical step in developing the science that, through close engagement with data companies and relevant state and federal bodies, will translate into vital government and commercial applications boosting both Australia's economy and society.												
DP240102200 Windsor, A/Prof Timothy D	**Understanding Ageism in Australia** Ageism refers to stereotypes, prejudice and discrimination towards people based on their age. This project aims to generate new knowledge in relation to older Australians' experiences of ageism by conducting a population-based survey of ageism and examining its links with mental health and wellbeing. The project will also use intensive longitudinal methods to study everyday ageism. Expected outcomes include identification of at-risk groups that can be used to inform government policy responses to tackling ageism and will inform the development of interventions and education programs to reduce ageism in the community. This should provide significant benefits for social inclusion, intergenerational solidarity and economic participation	161,166.50	263,830.00	181,374.00	78,710.50	0.00	0.00	685,081.00			England		
	National Interest Test Statement The World Health Organisation has highlighted the need to address ageism to create a more equal world where the dignity and rights of all people are respected and protected. Challenging ageism is also a prominent theme in the strategic priorities of Australian state governments including NSW, Victoria, and South Australia. Despite wide recognition that ageism is a significant social problem, there is currently a lack of Australian data that inform (1) how widely ageism is experienced by older adults, (2) the extent to which ageism is associated with poor outcomes for health and wellbeing, and (3) whether sub-groups in the population (e.g., those in poor health or with greater social disadvantage) are more vulnerable to ageism. Through both population-based and intensive longitudinal research, this project aims to establish the prevalence of ageism in Australia and identify processes underlying exposure and reactivity to ageism in middle and older adulthood. Establishing a better understanding of how, and the extent to which ageism affects older Australians is crucial to informing policy responses. Reducing ageism has the potential to create more cohesive communities and economic benefits through increased participation of older adults in work and volunteering. The findings of the research will be communicated to relevant federal, state and community organisations responsible for informing media and education campaigns concerned with promoting positive views of ageing.												
DP240102729 Petersen, Prof Janni	**EFR3: Novel gatekeeper of cell proliferation** This interdisciplinary, cross-institutional project uses leading-edge mass spectrometry and the yeast genetic model to enhance knowledge of fundamental signalling mechanisms common to cell proliferation of eukaryotic cells. Building on extensive preliminary data that identifies novel energy-stress control points, this research will generate insights into critical and conserved features of nutrient stress control of cell proliferation that ensures cell survival. This project advances basic and applied biology. Its outcomes will be relevant to several research areas and industries, specifically to the propagation of cell cultures that nowadays contributes to the production of a myriad of biotechnical and pharmaceutical commodities.	96,553.50	187,306.00	172,579.50	81,827.00	0.00	0.00	538,266.00					
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	The benefit to Australia of this interdisciplinary research lies in the improved understanding it will provide of nutrient and energy control of cell growth and cell proliferation. It is widely accepted that balancing energy production and use is critical for nearly all fundamental cellular functions. This research will provide insights into novel strategies to manipulate cell proliferation, a key part of the response to nutrient stress in eukaryotic cells that ensures survival. Because cell proliferation, growth and survival are universally dependent on nutrient availability, this knowledge will benefit any industrial programme utilizing and propagating living organisms. For instance, through further research and development, the project's outcomes could facilitate such practical gains as the ability to enhance biomass yields in biotechnology and pharmaceutical industries and to inhibit cell proliferation in nutrient-stressed diseases like metastatic cancer. Thus, this project is likely to have far-reaching beneficial relevance including in agriculture, medicine and bio-manufacturing. Any intellectual property arising from this research will be protected and application of it sought through normal commercialisation approaches. In addition, the project will lead to further innovation in leading-edge time-resolved mass spectrometry and the yeast genetic model to the benefit of future research in advanced biology.												
	Flinders University	388,280.00	744,180.50	710,259.50	354,359.00	0.00	0.00	2,197,079.00					
The University of Adelaide													
DP240100162 Withayachumnankul, Prof Withawat	**Leaky Dielectric Platform for Integrated Terahertz Components** This project aims to realise integrated terahertz components including programmable filters, compact spectrometers, frequency-scanning antennas, and broadband/broadside high-gain antennas. These components are crucial in emerging terahertz integration for field applications and will supersede decades-old bulky free-space terahertz counterparts. Silicon will be a key material for all of these terahertz structures to achieve tunability and highest efficiency. Effective medium theory will enable performance, functionality, integrability, and structural simplicity. The expected outcomes are building blocks towards high-speed 6G infrastructure and high-resolution stand-off sensing to reap economic benefits at the dawn of terahertz engineering.	89,135.00	182,270.00	189,770.00	96,635.00	0.00	0.00	557,810.00			Spain		
	National Interest Test Statement The terahertz region, situated between the microwave and optical regions, is the last underutilised part of the electromagnetic spectrum, and holds potential for future applications in advanced sensing and communications. Currently, terahertz technology is transitioning from laboratory-based demonstrations to practical field applications, demanding compact systems and integrated components that are still very immature. The project capitalises on Australian research strengths in terahertz technology, and in particular our recent success in the world's first integrated platform designed specifically for the terahertz spectrum. We will deliver key components including programmable filters, spectrometers, and antennas. These integrated components are enablers for high-resolution see-through imaging for security and high-speed wireless links for 6G communications. The research will contribute to Australia's technological sovereignty that is critical under growing geopolitical uncertainties. The invention will serve an emerging global demand in terahertz technology. An estimated global market for terahertz applications will reach USD 3.5 billion by 2029. Development of these critical terahertz components at this early stage is very promising to generate intellectual properties for Australia. To promote the outcomes beyond academia, we will disseminate through scientific media and bring to discussion with our existing and new global commercial partners for research translation.												
DP240100325 Bennetts, A/Prof Luke	**Linking wave–sea ice feedbacks to rapid ice retreat** Antarctic sea ice extent has been in sharp decline since 2016, which is stressing the fragile Southern Ocean and Antarctic environments so vital to the global climate. This project aims to investigate a crucial candidate mechanism of sea ice loss by predicting rapid ice retreat in response to large Southern Ocean waves. New theory and modelling capabilities that account for wave–ice feedbacks will underpin the predictions, leveraging on recent research	62,930.00	127,954.00	129,178.50	64,154.50	0.00	0.00	384,217.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	breakthroughs, including novel datasets derived from satellite and field observations. The outcomes are expected to quantify sea ice retreat due to ocean waves for the first time, with potentially major implications for coupled wave–sea ice modelling in climate studies. **National Interest Test Statement** Australia is being ravaged by climate change and the linked extreme weather events, which climate science predicts will become more frequent and widely distributed in the near future. Australia is particularly receptive to the alarming changes occurring in the Southern Ocean and Antarctica, such as dramatic sea ice retreat and its harmful repercussions for other components of the climate system. Antarctic sea ice retreat is correlated with increasing ocean-wave activity, and the correlation has been predicted to result from wave–ice feedbacks. This project will address outstanding theoretical and modelling gaps to quantify linkages between sea ice retreat and wave–ice feedbacks. State-of-the-art observations will be used to validate the model predictions. The project will give new modelling capabilities that empower improved projections of sea ice retreat. These will feed into Australia's next-generation sea ice–ocean model to inform mitigation and adaptation policies, thus creating social, economic and environmental benefits for Australia. Moreover, the project will provide training for research students and early-career researchers in Australia. We will engage with Australia's leading weather and climate institutes, the Bureau of Meteorology and CSIRO, to promote our findings and encourage adoption of the advances. Further, we will promote broad understanding of the project through public talks, news articles and social media.												
DP240100414 Zurbruegg, Prof Ralf	**Increasing confidence in Australian carbon disclosures** This project aims to investigate whether carbon disclosures made by Australian resource firms are less than actual emissions (i.e., carbonwashing) using satellite imagery technology. New knowledge will be generated by triangulating carbonwashing information against firm data, such as valuation, other disclosures, and hiring practices, to understand if and how carbonwashing impacts firm values and organisational controls. Expected outcomes include improved ways to detect carbonwashing and its relationship to management control weaknesses, benefiting all stakeholders (including investors and regulators) in supporting government-proposed reforms to the Australian Safeguard Mechanism in instilling confidence in Australian carbon disclosures. **National Interest Test Statement** Globally, there is a concerted effort to accelerate the process of reducing carbon emissions created by human activity. Even though Australia has committed to net zero emissions by 2050, there is little transparency when it comes to verifying the amount of carbon emission claims made by Australian resource companies, which raises questions on the discrepancy that may exist between actual versus reported emissions. Ultimately, this weakens Australia's position to benefit from the international market's demand for trusted efforts to reduce carbon emissions. This project will address the above lack of transparency by using novel satellite imagery technology to capture actual carbon emission releases from mine sites to determine potential discrepancies that exist between actual and reported emissions and how it can impact the value of the firm. This study will contribute to the Australian government's climate change policy as proposed by the Australian Safeguard Mechanism which introduces a carbon cap and trade by improving the confidence and transparency in Australian firms' carbon emission claims in the long run. This research will be promoted through peak industry and regulatory bodies, such as the Financial Services Council and the Australian Securities Investment Commission, and outcomes will be shared with key stakeholders of how discrepancies can be detected and how that may impact firm value and reputation.	64,585.50	116,370.50	85,112.50	33,327.50	0.00	0.00	299,396.00					
DP240101089 Stokes, Prof Yvonne M	**Mathematics to underpin and drive novel inertial microfluidic technologies** Particles suspended in flow through microfluidic ducts migrate under inertial and drag forcing to different regions in the cross-section depending on particle size, duct geometry and control parameters, enabling isolation of, for example, cancer cells/microplastics from a blood/water sample.	83,608.50	152,953.00	143,678.00	74,333.50	0.00	0.00	454,573.00			New Zealand, England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Device design needs mathematical models yielding understanding of the particle dynamics, and tools for determining geometry and control parameters. Particle boundary conditions strongly influence the inertial lift and drag forces that drive particle motion. This project will develop these mathematical tools for boundary conditions applicable to both passive and active particles, so driving development of novel devices for existing and new applications. **National Interest Test Statement** Particles being carried by a fluid along a duct or pipe migrate perpendicular to the direction of flow due to forces acting on them. This process, called “inertial migration”, can be utilised to isolate specific cells such as cancer/sperm cells from a blood/semen sample as well as to remove microplastics from a water sample. However, use of inertial migration is still in its infancy. Theoretical understanding is currently lacking, yet a deeper understanding is needed to drive development of novel devices for biomedical and industrial applications. We will address this need by developing theoretical models of inertial migration for both living and non-living particles in 3-dimensional flows of practical relevance. We will change assumptions made in previous theoretical studies that are likely incorrect for small and/or living particles. The understanding gained and tools developed by this project will enable identification of novel separation mechanisms and new applications enabling manufacture of new microfluidic devices of benefit to Australia and globally, in terms of improved medical diagnosis and commercial value. Results will be communicated via applied mathematics and fluid dynamics conferences and journals, including those of interest to practitioners/companies with the capability to utilise the results for novel device development. Codes will be made publicly available and experimental validation of theoretical results will be pursued.												
DP240101140 Shi, Prof Peng	**Insect-inspired flapping wing robots: autonomous flight control systems** This project aims to design a novel control scheme for insect-inspired, flapping-wing, micro aerial vehicles. This type of micro aerial vehicle has complex, periodic, time-varying and inherently unstable dynamics, which are practically challenging to model and implement in hardware. This project will design energy-based automatic stabilization and task-dependent control, and develop the insect-inspired platform for testing nonlinear control strategies. The expected outcomes will include new system and control theories, concepts, principles and technologies in controller design that can provide reliable flight control for bio-inspired, flapping-wing systems. **National Interest Test Statement** Most autonomous aerial vehicles, such as drones, use rotary wings, which are expensive and have technical and application limitations. Flapping-wing versions that mimic insects could provide an alternative due to smaller size, improved stability and agility, and reduced costs. This project aims to investigate how insects control their wings to maintain positions and respond to changes with various winds. These natural and theoretical findings will be used to develop a novel autonomous flight control system with the ability to mimic insect flight and provide better control performance for the aerial vehicle. The project-developed flapping-wing aerial vehicles will have considerable advantages in operating with low energy cost, stable and low noise flight and much improved safety compared with the conventional aerial vehicles and will have practical potentials. The resulting benefits of this research will provide a significant advancement in aerospace and flight control technologies for Australian industries that currently use autonomous aerial vehicles including agriculture, defence, planetary exploration and manufacturing. The project team will collaborate with their existing industry partners, including South Australian Department for Infrastructure and Transport, Codan and IBM, to develop better solutions to real world applications. The team will also promote the research outcome through publications and media about the project outcomes to reach out a wider audience.	83,827.00	168,730.50	175,299.00	90,395.50	0.00	0.00	518,252.00			Mexico, United States of America		
DP240101206 Nguyen, A/Prof Giang D	**A multi-scale theory for solid-granular transition due to fragmentation** The prediction of rock fragmentation and fragment sizes during its phase transition from solid (rock mass) to granular	75,565.00	161,130.00	171,130.00	85,565.00	0.00	0.00	493,390.00			England, Japan, France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	(ore fragments) is the most crucial problem in a cave mining operation. Current practice relies on empirical tools without fundamentals of fracture, and hence cannot reliably predict the fragmentation process and fragment sizes. This can lead to huge economic loss due to damage to extraction points, hold-ups for safety precautions, and mine closures. The project will develop a new theory and models to describe this solid-granular transition, and computational tools for simulations of cave mining operations. The expected benefits and outcomes include safer operations, and better control of production schedule and budgeting. **National Interest Test Statement** Australia's mining industry accounted for 12% of the gross domestic product, with mining exports worth $231 billion in 2020. To meet the ever-increasing demands of several industries that rely on minerals, large-scale underground mining methods are used, with cave mining being one of the most cost-effective and productive methods in Australia. Cave mining operations need to be thoroughly planned right from the mine design stage, given they are highly capital-intensive. This challenging task requires accurate predictions of how specific ore bodies will fracture and ore production at extraction points, which are beyond the reach of current empirical approaches in the mining industry. This project will develop models and computational simulation tools for rock fracture and fragmentation in underground conditions, all of which are missing in current design practice and operations of cave mines in the mining industry. It will offer a reliable and cost-effective approach for scenario analysis towards better mine design and ore extraction strategies. This will lead to safer and more efficient cave mining operations, help increase production rate, and avoid time delays in the production cycle of cave mining operations in Australia. The project's outcomes will be shared with the public to improve risk assessment & mitigation strategies for other underground operations in Australia, such as tunnelling in rocks and hydraulic fracturing in petroleum engineering.											
DP240101500 Bell, A/Prof Stephen G	**New biocatalysts for selective chemical oxidations under extreme conditions** This project will identify and design new enzyme biocatalysts which function under extreme conditions such as elevated temperature and high concentrations of peroxides. These enzymes will be sourced from microorganisms which are located in extreme biological environments e.g. hot springs (the so-called extremophiles). The expected outcome of this project are the identification of robust enzymes which can catalyse selective oxidation reactions in complex organic molecules, such as steroids. The new biocatalysts developed in this project will have significant benefit in the development of new routes to access bespoke molecules of value in fine chemical synthesis and drug development. **National Interest Test Statement** This project will develop of a new set of proteins known as 'biocatalysts' that can drive challenging chemical reactions under extreme conditions, such as high temperature. The new biocatalysts developed in this project will be obtained from microorganisms found in extreme environments, including unique examples identified in Australian hot springs which enable them to function in non-standard biological conditions, such as higher temperatures. These protein biocatalysts are widely viewed and employed for use in lab-scale chemical production and in a few cases in industrial steroid production. Understanding how these proteins function at high temperatures is crucial to their optimisation for larger scale production and to expand their industrial application. The development of the highly stable and active biocatalysts from this project will have far reaching benefits for Australian companies and researchers developing applications involving enzyme catalysis in the future and will train the next generation of the nation's chemists and biochemists to build Australia's capacity in this area of research. Ultimately it will enable the synthesis of new chemicals with applications in the prevention of infection of humans or crops resulting in economic, social and health benefits for Australia. We will use the outcomes of our research to engage with relevant government, biotechnology and chemical industry partners to ensure the optimal commercial and economic outcomes are obtained.	153,807.50	314,335.00	236,996.50	76,469.00	0.00	0.00	781,608.00					
DP240101673	**Comparative analysis of sensor noise for target detection in dragonfly eyes**	91,917.00	179,326.00	178,500.00	91,091.00	0.00	0.00	540,834.00				Sweden	

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Wiederman, A/Prof Steven	Dragonflies hunt tiny prey in the low-light conditions of late dusk, a signal-to-noise problem that challenges any engineered system. Using a comparative approach across dragonfly species, we aim to use novel optical and physiological measures to determine how sensors with noise underlie target-detection, in varying scene brightness. The project outcomes will be a comparative characterisation of signal-to-noise measures of dragonfly eye optics (including eye size) and early sensory neurons. We will match detection thresholds with downstream target-detecting neurons and dragonfly behaviour. This will provide insight into signal detection, which is a ubiquitous problem across information processing, computer vision and autonomous systems. **National Interest Test Statement** With a brain less than the size of a grain of rice, some dragonflies hunt tiny prey like mosquitoes, in the near darkness of late dusk. Neither humans, nor their technologies, match this signal-to-noise feat. Using a comparative approach, this project aims to probe what brain processing underlies these extraordinary capabilities. How signals are detected in noise is a fundamental problem applicable to sensing and information processing used in transport, manufacturing, surveillance and defence. For several years, working with industry and government, our laboratory has translated neuroscience discoveries into the development of autonomous systems. To address the Transport Science and Research Priority, computational models developed in this project would be integrated into our unmanned ground vehicle, tasked with moving payloads more safely and efficiently for the Australian community. These models would also aim to keep Australians safer, incorporated into our bio-inspired drones defending against threat drones. This project would contribute to the general neurosciences, providing a deeper understanding of how biological brains function. Knowledge gained would be disseminated widely to the Australian community, aimed at high impact publications. These biological and engineering insights may be used in the development of novel technologies that interface with the brain, such as the development of improved bionic vision systems and other augmentation technologies.												
DP240102019 Fordham, A/Prof Damien A	**Detecting and deciphering extinction dynamics under environmental change** This project aims to improve knowledge of extinction processes and impacts. It will use high-performance computing and museum collections to disentangle the ecological mechanisms that were integral in the initial decline and later extinction of Australia's unique mammals. Its significance is that it will establish the historical ranges and past population trajectories of Australian threatened mammals, pinpointing the combinations of ecological characteristics and threats that most affect risk of extinction from environmental change. Expected outcomes and benefits are new data and verified models to enrich conservation research and inform evidence-based solutions to better protect and recover some of Australia’s most threatened species. **National Interest Test Statement** Australia’s unique mammals have suffered the highest rate of recent extinctions of any continent. Gaining a better understanding of their past distributions and population abundances, and the processes that caused Australia’s threatened mammals to become rare, is key to reversing further declines. This project will use innovative models and high-resolution simulations based on natural history collections to reconstruct the timing, scale, and rate of mammal declines in Australia since 1788. Importantly, this will pinpoint ecological characteristics that affect risk of extinction from environmental change. Resulting data and ecological models will advance Australia’s leadership in conservation research and inform evidence-based solutions for protecting and recovering Australia’s most threatened mammals. New scientific understandings of how and why mammals decline will help Australia meet objectives of its national Threatened Species Action Plan by increasing the knowledge base for conservation managers and their organisations, improving vital on-the-ground management actions needed to prevent future extinctions. In	88,028.00	172,748.00	173,878.50	89,158.50	0.00	0.00	523,813.00			Denmark, Norway, Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	addition to academic outputs, the project will use established links with national and international agencies, including Australia's Threatened Species Commissioner and Scientific Committee, NGOs and natural history museums to disseminate and transfer its findings. Engagement with these and other specialists will maximise its cross-disciplinary research and impact.												
DP240102353 Mao, Dr Jianfeng	**Targeted electrolyte design for high energy aqueous batteries** The Project aims to develop a new generation, high-energy aqueous battery. A range of new aqueous electrolytes with large working window at low concentration will be designed to replace traditional, flammable and toxic organic electrolytes, and; low-cost and multi-electron reaction materials will be developed as high-capacity electrodes to replace traditional intercalation-type materials. The Project will establish the structure-property relationship for electrolytes and interphases via advanced characterization(s) and computation. The new battery will be safe, energetic and sustainable for the billion-dollar energy storage market for electric vehicle, and smart-grid whilst addressing concurrently battery safety and boosted energy-density.	62,500.00	127,500.00	127,500.00	62,500.00	0.00	0.00	380,000.00			United States of America		
	National Interest Test Statement This Project aims to increase energy density of inherently safe, aqueous batteries via combined experimental and computational methods at multiple length, and time, scales. It will provide new knowledge and pathways for optimising the design of high-energy density aqueous batteries for energy storage. The proposed Lithium-ion Sulphur battery systems will advance energy storage technology and integrate clean energy into Electric Vehicles and smart-grids in an efficient, safe and sustainable way. Project success will create intellectual property with potential for commercialised products to store renewable energy and improve reliability of electricity, boost capability and generate job opportunities in the Australian energy and manufacturing industries via technology transfer, reduce our dependence on fossil fuels, and facilitate the practical development for a cleaner and more sustainable Australia. The knowledge and technology generated from this project will be promoted through industry and technology exhibitions, professional seminars for researchers and stakeholders, high school STEM studies, and an active media presence to expand the influence of this exciting research outside academia.												
DP240102575 Zheng, A/Prof Yao	**Seawater Electrolysis for Hydrogen and Commodity Chemicals Production** This project aims at sustainable production of hydrogen and chlorine-containing chemicals via development of revolutionary electrocatalysis that uses abundant seawater to replace scarce freshwater as feedstock. Fundamental science will be developed for addressing the knowledge gap between well-developed purified water electrolysis and emerging saline surface water electrolysis. Outcomes will include new knowledge of complex reaction mechanism(s), new electrode materials design, and relative device development for seawater electrolysis. This project will significantly benefit renewable energy use and commodity-chemicals manufacturing, together with reducing pressure on Australia's freshwater scarcity.	92,689.50	195,969.00	207,773.00	104,493.50	0.00	0.00	600,925.00			China (excludes SARs and Taiwan)		
	National Interest Test Statement The development of green energy technologies is essential to Australia achieving net zero emission goals, while still fulfilling energy demands. One approach involves the generation of hydrogen through a chemical process known as electrolysis, where a renewable electrical current is used to separate the hydrogen from the oxygen in purified fresh water. This project will exploit Australia's abundant natural solar and seawater resources in a novel												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	electrolysis system. The proposed new electrolyser will have greater efficiency and be more sustainable than current ones by using seawater as feedstock. Using advanced instrumental techniques, we will design and produce new materials that will be suitable for seawater electrolysis. Project outcomes will grow scientific and technological knowledge in Australia by providing advanced technological solutions to conversion and storage of intermittent renewable energies and seawater sources with high energy density, that are safe and readily stored and transported, and that are, importantly, socially acceptable. Communication of results will be through workshops with industry partners and media releases on social media. This technology and its commercial development through the hydrogen industry will position Australia as a key player in the green hydrogen industry.												
DP240102707 Wang, Prof Shaobin	**CO2-coupled photothermal catalysis on superlattice structures** This project aims to develop a structure-tailored platform of superlattice materials for photothermal catalytic conversion of natural gases to valuable fuels and chemicals. Innovations lie in engineered atomic and bulk scale nanocrystals for high-efficiency sunlight harvesting to drive CO2-coupled catalysis of C-H bond activation. Advanced characterisations and multiscale computations will enable mechanistic insights into the synergy of photo and thermal catalysis in hydrocarbon conversions. The projects will result in next-generation intelligent materials and clean technologies for solar fuels production and CO2 recycling. Outcomes will benefit Australia's long-term energy security and sustainability toward a carbon-neutral society.	88,803.50	182,107.00	186,607.00	93,303.50	0.00	0.00	550,821.00			Japan, Korea, Republic of (South), United States of America		
	National Interest Test Statement Australia is blessed with substantial reserves of natural gas resources and strong solar radiation over the majority of Australia's lands. In an effective leverage of these resources, this project will provide a next-generation technology for catalytic chemical reactions using advanced materials in a periodic structure of layers to harvest sunlight for natural gas conversion to fuels and chemicals. These advanced materials will efficiently drive different reactions under sunlight for reforming low-cost natural gas with carbon dioxide into high-value chemicals and feedstocks such as ethene and syngas with minimal energy input and in a sustainable manner. The products will help empower Australia's chemical industry for green production of polymers, oil fuels, and pharmaceuticals. The expected outcomes of the project will be disseminated to Australian gas and coal industry for process upgrading and secure Australia's leading role in advanced manufacturing high-performance materials, minimising carbon footprint, and cutting-edge technologies for carbon dioxide and natural gas utilisation to clean fuels and chemicals, promoting gas energy sector and coal mining industry toward carbon neutralisation.												
DP240102839 Zanotti, A/Prof James M	**Unravelling the neutron lifetime puzzle with lattice quantum chromodynamics** This project will perform supercomputer simulations to confront one of the outstanding puzzles of nuclear and particle physics, the neutron lifetime. New knowledge will be generated through the development of novel theoretical and numerical techniques to increase the precision of the leading theoretical inputs required to predict the neutron lifetime. The outcomes will provide crucial theoretical guidance into understanding the neutron; helping to guide the next-generation neutron experiments, from particle physics to applications in advanced materials science. The results will have immediate benefit by resolving the neutron lifetime puzzle, while enabling Australian scientists to take a leadership role in this area of fundamental science.	65,884.50	139,289.00	150,022.50	76,618.00	0.00	0.00	431,814.00			Germany, England, Scotland		
	National Interest Test Statement Fundamental research in nuclear science has led to breakthrough discoveries in a wide range of areas, including energy production, medical applications, materials science, and nuclear safety. This project will further contribute to												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	this important area by generating new knowledge about the most elementary nuclear decay – the decay of the neutron. The insights gained from this research will have far-reaching benefits, including advancements in fundamental particle physics, cosmological evolution, and advanced materials science. By gaining a deeper understanding of this fundamental nuclear process, scientists can build a foundation for future discoveries that can be adopted by national priority industries in the energy, security, and defense sectors. This project will also build national expertise in fundamental nuclear physics, maintaining the talent pipeline in Australia to contribute to the global effort and secure Australia's reputation in this field. To promote research outcomes in fundamental science beyond academia, this project will actively engage with the public and key stakeholders. This will be achieved by communicating research findings through public lectures and outreach activities in combination with conference presentations and journal publications. By doing so, this proposal help bridge the gap between academic research and real-world impact, while also promoting public understanding and support for science.												
DP240103070 Zhang, Dr Wei	**Towards knowledge discovery from imperfect and evolving data** Information extraction from data is critical, both to analyse and protect consumer data. However, many learning techniques are developed using perfect, static datasets, quite different to messy, ever-changing real-world data. This project aims to develop data analytics techniques that can extract accurate information in complex structures from imperfect/incomplete data that changes over time. Expected outcomes are a prototype tool, tested on real datasets, that combines new techniques in data modelling, algorithm development, and system design. Likely benefits are enhanced Australia's competence in data science through student training and new, robust data tools relevant to critical sectors such as cybersecurity, healthcare, and defence.	43,305.00	94,735.00	102,860.00	51,430.00	0.00	0.00	292,330.00					
	National Interest Test Statement The explosive growth of data collection creates new opportunities for beneficial data mining for businesses and service providers, but also for malicious subversion or cyber-attack. Analysis, or protection, of real-world datasets is complicated by their dynamic and imperfect nature — which is often very different from the static, clean, and complete training datasets used to develop machine learning techniques. This project aims to develop advanced techniques to extract accurate information in complex structures from imperfect, evolving data to enable accurate data analytics, knowledge comprehension, and decision-making from real-world data. Outcomes are expected to include a series of techniques, combined into a prototype tool, that cover data modelling, algorithm development, and system design. This prototype will be tested on real datasets from critical domestic sectors such as defence, finance, and healthcare, and showcased to contacts in these industries to explore avenues for translation to enhance cybersecurity. Sharing these ground-breaking discoveries widely with academics, industry community and general public through publications, conference talks, workshops and social media networks, this project will benefit both fundamental research into data-driven algorithms, enhancing Australia's global leadership in data science; generate robust learning models for data-driven intelligence-based applications; and contribute to increased cyber-protection for Australian data.												
DP240103201 Kotooussov, Prof Andrei G	**Fatigue Life Assessment of Structures under Realistic Loading Conditions** The project will develop a new methodology for the assessment of fatigue life of structures subjected to realistic loading conditions. This new methodology is based on recent advances in experimental techniques which make possible, for the first time, the investigation of the crack opening/closure mechanisms and the crack driving force for large numbers of fatigue cycles (>1 million) of variable amplitude, representative of real-world applications. The project will expand Australia's knowledge base and research capabilities in structural life prognosis. It will increase the competitiveness of domestic products and industries, fostering international collaborations and	86,964.50	179,519.00	177,002.50	84,448.00	0.00	0.00	527,934.00			Spain, Portugal, France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	leadership of Australia in this strategically important area of research. **National Interest Test Statement** Fatigue is the leading failure mechanism of mechanical components and imposes a significant socio-economic burden on nations worldwide, including Australia. A notable example is the fatigue failure of the overhead high-voltage conductor, which ignited the Kilmore East fire in September 2009 and led to the tragic loss of 173 lives. This research project will develop a new methodology for the fatigue life assessment of structural components, which will help to reduce the risk of catastrophic failures, improve reliability, efficiency and international competitiveness of Australian industries and products, and foster public trust in technological advances. Project outcomes will contribute to the Australian Government priority areas of Transport, Energy and Advanced Manufacturing, by adding value to advanced structural design, integrity assessment and reduced-cost maintenance of high-value assets. Project outcomes will be disseminated to a wide range of government agencies and research organisations through high-impact journals, conferences and workshops to help expand the knowledge base and Australia's research capabilities in structural life prognosis, fostering international collaboration and leadership of Australia in this strategically important area of research.												
DP240103278 Abbasnejad, Dr Ehsan M	**Learning to Reason in Reinforcement Learning** Deep Reinforcement Learning (RL) uses deep neural networks to represent and learn optimal decision-making policies for intelligent agents in complex environments. However, most RL approaches require millions of episodes to converge to good policies, making it difficult for RL to be applied in real-world scenarios taking significant resources. This project aims to equip RL with capabilities such as counterfactual reasoning and outcome anticipation to significantly reduce the number of interactions required, improve generalisation, and provide the agent with the capability to consider the cause-effects. These improvements would narrow the gap between AI and human capabilities and broaden the adoption of RL in real-world applications.	87,781.00	179,242.00	184,494.50	93,033.50	0.00	0.00	544,551.00			Switzerland, Canada		
	National Interest Test Statement Machine Learning aims to produce intelligent machines that can learn from observations. One powerful approach is Reinforcement Learning (RL) which interacts with its environment and observes the outcomes to learn. OpenAI's ChatGPT and DeepMind's AlphaGo are currently utilising RL to advance the field of artificial intelligence (AI) and develop groundbreaking technologies. However, due to the significant computational requirements of this technology, its use has been primarily limited to large organisations. Even then, there are ethical and social concerns since these models learned only the association of patterns. This project aims to develop RL with new reasoning abilities, where machines learn to reason about the cause of decisions and alternative scenarios. This doesn't require interactions, leading to cheaper, more accessible and reliable approaches. It bridges the gap between AI and human intelligence. Outcomes will have enormous potential in various fields, including robotics, material and drug discovery, autonomous driving, and enhanced chat agents. This project boosts Australian capabilities in AI, supporting innovation and developing Australia's expertise. Building capability in emerging technologies within the digital economy drives Australian productivity and prosperity, creates jobs and enables solving today's problems and growing tomorrow's businesses and sectors. Outcomes will be communicated to the broader public through social media and demonstrations.												
DP240103404 Abbott, Prof Derek	**Next Generation Terahertz Materials** We will investigate novel tuneable terahertz (THz) metamaterials, based on the exploitation of phase change materials. Tunable metamaterial-based terahertz devices, such as modulators and filters, will potentially generate significant downstream IP for short-path wireless applications. This fills a critical need to meet the increasing demand for greater bandwidth. Elucidation of the fundamental science underlying the interaction between terahertz signals and phase-change materials will enable tuneable metamaterials. A major leap will be devices that	89,500.00	183,000.00	191,000.00	97,500.00	0.00	0.00	561,000.00			France, Japan, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	can steer and modulate terahertz signals with unprecedented agility and compactness; enabling future high-bandwidth desktop data transfer. **National Interest Test Statement** Terahertz systems show wide potential and will be critically useful for advanced new Bluetooth-like connectivity for sharing data between desktop mobile devices, such as phones and laptops. However, a number of critical technical hurdles with terahertz systems currently limit their ability. This project will exploit the use of advanced new materials, enabling tuneable devices that can control and manipulate terahertz radiation (T-rays) for short-path ultra-high-speed wireless data links. The lack of suitable tuneable devices is the gap we will address, building upon Australian excellence in the photonics arena. The ability to electronically tune these devices will result in very compact practical multifunctional solutions that will not only impact future high-speed Bluetooth-like transfer, but will also benefit applications in security and biosensing. The outcomes of this project will maintain Australia's knowledge in this cutting-edge area and provide an opportunity for new advanced tuneable devices that will benefit Australia for downstream potential IP in a large international market. This will benefit Australia by creating new materials and technologies and by training the next generation of scientists in photonics, which will position them for valuable roles in Australia's future workforce. We will disseminate our research findings through both scientific publication in leading journals as well as through public announcements on social media.												
	The University of Adelaide	1,410,831.50	2,857,178.00	2,810,802.50	1,364,456.00	0.00	0.00	8,443,268.00					
University of South Australia													
DP240100484 De Laat, Prof Dr Maarten F	**Equipping Australian teachers today to face AI tomorrow** Applications of Artificial Intelligence (AI) are set to transform society, including how people work and learn. Yet there is very little research about what Australian teachers need to know in order to prepare students to thrive in an AI-rich society and workforce. This study aims to construct a foundational understanding for teaching with and about AI. It will also show how to develop effective networks to empower teachers as active change agents. The expected outcomes will equip teachers with the knowledge and resources to lead the development of Australia's future AI capability, including through enhanced classroom practices and more creative teacher networks.	59,112.50	116,628.50	118,372.00	117,285.00	56,429.00	0.00	467,827.00			Germany, Singapore, Denmark, Sweden, England		
	National Interest Test Statement AI is revolutionising the way we live and interact with the world. Its effects are still emerging, but critical impacts are visible in the changing nature of human learning and work. The Australian Government's AI Action Plan states that investment in AI and training is a national priority to secure a future as a technologically capable country. But despite advances of AI in industry, in schools it is still at the early stages of development. AI adoption in schools presents a double challenge: teachers are not adequately prepared to integrate AI in the classroom, and AI resources do not sufficiently address teachers' needs, imposing new teaching and ethical challenges. To address this gap effectively there is a need to collaborate with teachers to push the boundaries of research by benchmarking AI literacy and capability development. This study aims to construct a foundational understanding for teaching with and about AI, evidencing how to develop productive teacher networks and empower them as active change agents. The outcomes will equip teachers with the knowledge and resources to lead the development of Australia's future AI capability, including through enhanced classroom practices, learning resources and effective professional teacher networks. Findings will be communicated with teachers as co-authors, translating research in results into open access tangible academic and free easy-to-use evidence-informed practical resources on AI in the classroom.												
DP240101427 Kumar, Prof Sharad	**New mechanisms regulating the biogenesis of extracellular vesicles** Extracellular vesicles are small packages that contain active components derived from the cell of origin. These vesicles, released by most cell types, are critical for communication	104,528.50	221,374.00	224,672.50	107,827.00	0.00	0.00	658,402.00			Scotland, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	between cells. However, the processes of their formation and release remain poorly understood. This project aims to explore how ubiquitination, a type of protein modification system, controls the production of extracellular vesicles. Using a strong collaborative team and highly innovative approaches, the project will generate new knowledge to inform how cells communicate. Expected outcomes include knowledge of broad significance to cell biology, that can be leveraged to develop extracellular vesicles as tools for various biotechnology applications in the future. **National Interest Test Statement** The average human body is composed of around thirty trillion cells and efficient communication between them is vital for optimal organ function. If cells are unable to communicate correctly, this can lead to disruptions in normal physiology. To aid communication, cells release various components stored in membrane bound packages, called extracellular vesicles or EVs in short. EVs deliver their information to host cells close by or in distant locations in the body. We recently discovered that EV generation is controlled by a cellular protein modification system that attaches a small protein tag to some proteins involved in EV production. The goal of this project is to gain further insight into the mechanisms of this process as there is a significant gap between what we have discovered and how this relates to controlling EV genesis and function. We anticipate that this research will contribute to building Australia's research capability in this field and has the potential to generate high-impact knowledge across various fields, such as cell biology, biochemistry, and molecular biology. Furthermore, the knowledge it yields can be applied in the biotechnology industry to develop tools for animal and human health, as well as for diagnostic purposes in the future.												
DP240101581 Xu, Prof Haolan	**Multi-energy driven photothermal evaporators for all-weather desalination** This project aims to develop advanced Interfacial solar evaporation (ISE) technology to stably deliver clean water. This project expects to facilitate desalination practices by generating new ISE systems that use multiple energy sources from the environment and can operate under different weather conditions. Expected outcomes of this project include new knowledge in the area of renewable energy, improved ISE technique and enhanced capacity for desalination and industrial wastewater treatment. This should provide significant benefits to remote communities who suffer from severe freshwater shortages and enhance research capabilities to position Australia as a global leader in developing green and affordable desalination technologies. **National Interest Test Statement** Many Australians living in remote and rural areas have very limited access to quality drinking water. Solar evaporation technology is a green and affordable solution as it only consumes solar light as an energy source. However, it only works well when sunlight is present. This project aims to develop photothermal evaporators that can use multiple energy sources from the environment to provide a constant supply of clean water under all weather conditions, night and day. Sustainable, low-cost and easily deployable, the evaporators are an ideal complement to the current reverse osmosis membrane desalination technology and can thus enable all areas throughout Australia to access a drinkable water supply. This has social, environmental and economic benefits, contributing to the life quality and health of the people living in remote areas as well as local agriculture and livestock, and to the growth of Australia’s water and environmental industry.	85,642.50	173,430.50	183,216.00	95,428.00	0.00	0.00	537,717.00			Canada		
DP240102256 Morrison, Prof Janna L	**Size matters, but at what cost? Role of male sex hormones in the placenta** This project aims to understand molecular pathways regulated by male sex hormones in the placenta that may	104,121.00	197,542.00	183,735.50	90,314.50	0.00	0.00	575,713.00			England, Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	contribute to sex-specific fetal growth and survival outcomes in response to reduced oxygen and/or glucose. Through this project, we expect to generate new knowledge of the mechanisms that drive sex-specific placental molecular function using interdisciplinary approaches. The application of this advanced understanding of the sex-specific regulation of placental molecular function and fetal growth may be targeted in future studies to improve fetal growth outcomes in placental mammals such as livestock, domestic pets, and humans. **National Interest Test Statement** Early miscarriage and stillbirth are major emotional and economic burdens for Australians. These tragedies affect livestock, domestic pets, endangered species, and humans, and one of the main contributors is reduced fetal growth and poor placental function in response to challenges – be these normal or pathological – within the womb. Although larger, male fetuses of placental mammals are more likely to experience growth and survival challenges than females, the reason for which may be explained by changes to signalling pathways of male sex hormones in the placenta. We will investigate this potential pathway of interest using cutting-edge molecular laboratory techniques paired with big-data analyses. The benefits of our work include new knowledge gained that may be applied to future projects aimed at developing strategies and possible interventions to improve fetal growth, thereby reducing the emotional and economic burden for Australians. We will communicate our findings through multiple media platforms that will target all Australians, key national and international stakeholders, and researchers that may benefit from the knowledge gained.												
DP240103154 White, Dr Jessica	**Finding Australia's Disabled Authors: Connection, Creativity, Community** This research project aims to explore disabled writers and disability more generally in Australian literature. As there is little awareness of the contribution that Australian authors with disability have made to literary culture, the project expects to generate new knowledge about how disabled people have forged their writing careers, and how their disability shapes their creative practice. The expected outcomes include a greater understanding of the diversity of Australian writers and literature, community engagement with disability, and support for emerging disabled writers. The project will provide significant benefits including a greater awareness of disability and the capacity to combat ableism and discrimination. **National Interest Test Statement** Disabled people in Australia not only face poorer education, employment and health outcomes, and experience sustained forms of neglect and mistreatment, they are also missing from our national literature. This project aims to address this problem by investigating who Australia's disabled authors are, how they have forged their writing careers, and how their disability shapes their creative practice. Expected outcomes include a greater understanding of the diversity of Australian writers and literature, and of the creativity and adaptability that disability engenders, and support for emerging disabled writers. Shining a spotlight on disability in literature can provide cultural and social benefits by challenging stereotypes about disabled writers, which assists with changing attitudes towards disability in the community. To help achieve these outcomes the project will contribute to the expansion of the 'Writing Disability in Australia' database in AustLit (the Australian literature database), promote research findings in scholarly and non-scholarly publications, and create an accessible public-facing web resource.	54,244.50	106,305.50	52,061.00	0.00	0.00	0.00	212,611.00					
DP240103259 Harvey, Prof Natasha L	**Defining how cells relay mechanical signals to changes in cell architecture** Mechanical signals play crucial roles in shaping organs and entire organisms during development, though how these signals are relayed to changes in cell architecture is a major	151,441.00	310,050.00	322,483.50	163,874.50	0.00	0.00	947,849.00			United States of America, England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	unanswered question. Within vascular networks, mechanical signals including fluid flow, tension and stretch play key roles in vessel patterning, identity and maturation. This application aims to employ cutting-edge technologies to determine how the atypical cadherin FAT4 relays mechanical signals including flow and tension to the lymphatic endothelial cell skeleton, thereby enabling changes in cell shape important for building lymphatic vessels. This project will increase our understanding of how cells sense touch and may be applied for tissue engineering purposes.												
	National Interest Test Statement During development, mechanical signals including fluid flow, stretch and tension play important roles in shaping organs and entire organisms. There is a major gap in our knowledge however, regarding the mechanisms by which these signals are received and relayed to changes in cell shape that are needed for building organs. Through interdisciplinary national and international collaborations, this project will address this knowledge gap by investigating how a cell surface molecule called FAT4 transmits mechanical signals to changes in cell shape that underpin the construction of functional lymphatic vessels. Lymphatic vessels play crucial roles in regulating tissue fluid levels, carrying immune cells through our bodies and regulating the activity of multiple populations of tissue stem cells. Revealing new insight to the processes by which mechanical signals shape lymphatic vessels during development has implications for the many other tissues in which FAT4 plays important roles. Knowledge generated from the project will be applied to the development of stem cell programming and tissue engineering approaches to generate organs ex vivo and therefore has potential to yield future economic benefits for Australia. This project will also facilitate the world class training of postgraduate research students and fellows in state-of-the-art technologies, building Australia's skill base and international research standing.												
University of South Australia		559,090.00	1,125,330.50	1,084,540.50	574,729.00	56,429.00	0.00	3,400,119.00					
South Australia		2,358,201.50	4,726,689.00	4,605,602.50	2,293,544.00	56,429.00	0.00	14,040,466.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)

Tasmania

University of Tasmania

DP240100714 Flies, Dr Andrew S	**Development of an immunology toolbox to combat emerging marsupial diseases** Disease is increasingly a driver of wildlife population declines in Australia. However, basic immunology tools for >99% of vertebrate species are scarce, limiting our ability to prevent and respond to emerging and endemic diseases, such as devil facial tumour disease and wobbly possum disease. The overarching goal of this project is to improve wildlife health and fill the marsupial immunology gap by developing a long-overdue multispecies marsupial immunology toolbox. The toolbox is needed to accelerate devil facial tumour disease vaccine progress and conservation immunology research. It will expand our knowledge of wobbly possum disease virus that is increasingly reported in Tasmania and the risk posed by the virus to other possum species. **National Interest Test Statement** Australia is home to hundreds of marsupial species found nowhere else in the world. Unfortunately, disease is increasingly threatening Australia's unique species. For example, the first Tasmanian devil facial tumour (DFT1) discovered in 1996 has led to 82% declines in regional devil populations. In 2014 a second type of devil facial tumour (DFT2) was discovered on a peninsula in southern Tasmania and is now starting to spread. COVID-19 vaccines were rolled out in less than a year and saved 14 million lives in 2021. A DFT1 vaccine like one of the most widely used COVID-19 vaccines has been developed, but better immunology tools are needed for the DFT1 vaccine trials and to accelerate DFT2 vaccine development. This project will use an innovative multispecies approach to develop advanced tools that will be used for devils and many other marsupial species. They can be used to help animals that contribute to human well-being and generate substantial economic benefits through tourism and ecosystem services. The project will generate highly-skilled students and researchers that are competitive in the international biotech sector. This project will move the whole field of animal immunology forward by making high-quality, low-cost immunology tools available to Australian researchers. The research team works closely with the Tasmanian government and stakeholders to ensure the research is translated into practice.	77,562.50	165,455.00	172,685.00	84,792.50	0.00	0.00	500,495.00			New Zealand, England		
DP240100719 Richardson, Prof Benjamin J	**Using Conservation Covenants for Ecosystem Restoration & Climate Adaptation** This project aims to investigate the role of conservation covenants in facilitating ecological restoration and adaptation to climate change. In light of international experience, the project examines Australia's legal experience with conservation covenants, with case studies in NSW, Queensland, Tasmania and Victoria. The project expects to generate new theoretical insights and practical knowledge about the obstacles and opportunities for enabling covenants to play a more ambitious role in meeting biodiversity conservation and recovery goals. This should generate significant benefits to Australia in meeting its international environmental obligations, and improving collaboration between governments and community and landholder stakeholders.	45,119.00	94,271.00	105,804.00	56,652.00	0.00	0.00	301,846.00			United States of America, England, Canada, New Zealand		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement This project addresses an under-researched but nationally important challenge, concerning how the law can help Australia's landholders to restore degraded ecosystems and adapt to climate change. Private landholders have a vital role in helping Australia meet its biodiversity conservation and recovery goals, as the majority of the continent's land is owned or managed by nongovernment actors. Given significant past ecological damage and increasing future degradation due to climate change, suitable legal tools are needed to enable landholders to help address these challenges. Conservation covenants have become popular with environmentally concerned landholders but they appear to be limited by a bias to protecting existing conservation values rather than targeting areas to be restored or adapted to climate change. Aligned with current and proposed national initiatives such as the Nature Positive Plan, the research will benefit Australian governments and nongovernmental stakeholders by examining how existing covenants might better address these environmental challenges and to identify realistic pathways for law reform to enhance the contribution of covenants. The research will be undertaken closely with non-academic stakeholders, such as community bodies that help administer conservation covenants, and benefit them and landholders by generating better ways to use covenants to meet ecological restoration and climate adaptation goals.												
DP240101842 Cole, Prof Andrew A	**Lifting the Veil on Cold Planets in the Inner Galaxy** The project aims to explore a unique aspect of exoplanet detection: searches for cold planets of Earth mass and larger in the densest stellar fields of the inner Milky Way. Infrared cameras will be used to detect small planets in this extreme galactic environment. The proposed project will open a new era of infrared microlensing observations from the ground and supply critical data in preparation for the next generation of microlensing from space. This work directly links to the Nancy Grace Roman Telescope (2026 launch) Galactic Exoplanet Survey. Expected outcomes are a greatly improved understanding of planet formation down to terrestrial-mass planets, and improved techniques for cold planet detection with gravitational microlensing.	116,500.00	206,500.00	165,000.00	75,000.00	0.00	0.00	563,000.00			United States of America, France, Japan, South Africa		
	National Interest Test Statement “How do stars and planets form?” is one of the fundamental research questions identified in the Australian Academy of Science decadal plan for Australian astronomy (2016-2025). Our project directly addresses this problem by detecting and describing a predicted group of cold planets that are not detectable by any other method, and whose properties provide unique observable constraints on theories of planet formation. Understanding how common Earth-like planets are and how they form has the potential to transform the way we understand the place of humanity in the Universe. Australia has a long history at the forefront of the astronomical and space sciences. By fostering interaction with colleagues overseas the project will contribute to Australia’s international scientific standing. Because this project relies on existing international infrastructure investments, it provides good value for money by ensuring that Australian researchers are extracting benefit from these global resources. The project will contribute to the training of the next generation of knowledge workers, supplying critical demand for a highly skilled STEM work force needed to take advantage of Australia's burgeoning sovereign capabilities in the space sector. Our graduates are highly employable in space domain awareness, defence, and the satellite industry as well as in secondary and tertiary education.												
DP240102358 Phillips, A/Prof Helen E	**Antarctica's leaky defence to poleward heat transport** Southern Ocean currents are barriers to the oceanic transport of heat toward Antarctica. This barrier breaks down at key locations along their path and the poleward heat transport is enhanced. Changing winds are expected to accelerate heat transport, threatening ice shelves that protect Antarctic glaciers from ocean-driven melt. This project aims to advance understanding of the small-scale processes that control heat transport across the Southern Ocean. By combining funded international field campaigns that harness new advances in observing systems with next-generation numerical modelling, this research will create a step-change in our ability to predict Southern Ocean environmental change.	117,501.50	286,834.50	264,670.00	174,889.00	79,552.00	0.00	923,447.00			United States of America, Korea, Republic of (South)		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement Antarctica is a frozen continent surrounded by icy waters. The reason that warmer waters to the north are kept away from Antarctica are the powerful ocean currents, called the Antarctic Circumpolar Current and Antarctic Slope Current, that encircle Antarctica. These currents create barriers to the southward movement of warm waters but in some places the barrier leaks and heat gets through. This often occurs in places where deep currents run into rough undersea mountains, causing the currents to become wavy and create eddies. These eddies allow heat to move across the barrier and closer to Antarctica. We know that the strong winds over the Southern Ocean have a big impact on the currents and stronger winds lead to more eddies. The westerly winds have been getting stronger for decades and are likely to continue to get stronger. We expect that the southward movement of heat will increase as a result, which will increase the rate that Antarctica is melting and sea levels are rising. Our project will use new observations and models of the ocean to understand how eddies are moving heat towards Antarctica. We will apply this new understanding to turn daily maps of ocean sea surface height from satellites into daily maps of the movement of heat in the Southern Ocean toward Antarctica. This information will help governments plan how to respond to rising sea levels and how fast they need to act.												
DP240102970 Shabala, A/Prof Stanislav	**Cosmic powerhouses: The birth, death, and legacy of black hole jets** This project targets relativistic jets powered by supermassive black holes - the most powerful systems in the Universe. Theoretically, the enormous energies released have a profound influence on how galaxies evolve; empirically, observations reveal signatures of their impact across cosmic time. However, fundamental questions remain about how these jets are triggered and what impact they have on galaxies. The project will address these questions using novel supercomputer models of black hole jets in realistic cosmological environments, then confront these predictions with new data from Square Kilometre Array (SKA) pathfinding radio telescopes. This will substantially enhance Australia's leadership capacity in a strategically important area.	88,300.00	185,698.00	185,325.00	87,927.00	0.00	0.00	547,250.00			Netherlands, England, Italy, United States of America, Canada		
	National Interest Test Statement Powerful outbursts - known as jets - are launched by black holes at the centres of galaxies. These jets are the most energetic phenomena in the Universe, yet we still know very little about how they are produced and how they interact with their surroundings. Using one of the largest-ever numerical experiments on Australia's leading supercomputer, and data from top Australian and international telescopes, our team of international experts will bridge jet theory and observations. The outcomes will address a key question in astronomy by determining the impact these jets have on galaxies. We will make predictions that will be tested with Australia's Square Kilometre Array mega-telescope. This research will help to maximise the return on Australia's >$100M scientific investment through international leadership in a strategically key area, providing a research infrastructure for scientists, and training STEM graduates in state-of-the-art supercomputing, data science techniques and working with cutting edge radio telescopes. We will inspire high school students by exposing them to genuine astronomical datasets.												
	University of Tasmania	444,983.00	938,758.50	893,484.00	479,260.50	79,552.00	0.00	2,836,038.00					
	Tasmania	444,983.00	938,758.50	893,484.00	479,260.50	79,552.00	0.00	2,836,038.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Victoria													
Deakin University													
DP240100161 Bright, Prof David A	**Analysing and disrupting outlaw motorcycle gangs in Australia** This project aims to reveal the structure and social dynamics of co-offending networks by OMCGs in Australia. Outlaw motorcycle gangs (OMCGs) cause significant social and economic harm in Australia and internationally. The project will generate new knowledge about OMCG co-offending using an innovative multimethod approach combining social network analysis with interviews and focus groups. Expected outcomes include a deeper understanding of OMCG criminal activity across Australia and refined theory development about co-offending in criminal groups. The project will lead to improved policy, legislation and policing practice to prevent OMCG crime and dismantle OMCG criminal networks in more cost-effective ways.	22,485.00	74,934.50	98,802.50	46,353.00	0.00	0.00	242,575.00			Netherlands, Canada		
	National Interest Test Statement Crimes committed by Outlaw Motorcycle Gangs (OMCGs) cause significant social and economic harm for Australian and international communities. However, little is currently known about co-offending by members of OMCGs. This project will shed light on co-offending within and between OMCG clubs, document changes over time, and develop more effective policies and practices to disrupt OMCG crime. Results of the project will be communicated to criminal justice personnel, especially those working in law enforcement and criminal intelligence agencies tasked with disrupting crime committed by OMCGs and other organised criminal groups. A report summarising the findings of the Project will be produced and shared with law enforcement practitioners and policymakers and will be made publicly available via the project website. The domain expert workshop will demonstrate how our methodology can be utilised by crime analysts and other law enforcement personnel. The project will lead to enhanced capability for law enforcement and criminal intelligence agencies to prevent and disrupt OMCG crime. Benefits will include direct and indirect cost savings from reduced crime and from more targeted and cost-effective prevention and disruption methodologies. The project will contribute to making Australia safer from the harms of criminal activities undertaken by OMCGs and position Australia as a global leader in the field of criminal networks and methodologies to prevent and disrupt related crime.												
DP240100432 Stokes, A/Prof Patrick A	**Digital Death and Immortality** This project will create a philosophically-informed ethical approach for managing the 'digital remains' of internet users who have died. Emerging artificial intelligence technologies make it possible to reuse and interact with these digital remains. This offers new ways of commemorating the dead and for managing grief. Yet these technologies also threaten to exploit the dead and to change our relationship to them in troubling ways. Expected outcomes of the project include guidance for the ethical use of these technologies and policy recommendations for regulating the reuse of digital remains. This will provide significant benefits by helping Australia to avoid the ethical dangers inherent in emerging technologies of 'digital reanimation.'	15,609.00	31,301.50	30,905.50	15,213.00	0.00	0.00	93,029.00			Netherlands		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement A legacy of today's digitally driven world is the increasing number of 'digital remains' a person leaves behind after they die, such as audio and image files, social media accounts and emails. How to deal with these digital remains has become an increasingly significant and costly problem for individuals, families, organisations, tech companies, and governments. Existing legal approaches focus on treating digital remains as a form of property, but they do not fully capture the sensitivities and significance of digital remains in people's lives. Additionally, a property-only approach cannot address the dangers of 'digital reanimation' – emerging technologies that re-use digital remains to 'revive' the dead. From posthumous chatbots to CGI performances from dead actors, it creates an ethical dilemma for digital souls. This project will help to understand what sort of ethical significance digital remains have, and determine how they should be preserved, reused or disposed of. Outputs will be shared via workshops, policy papers and media commentary to engage industry, government, academia and the public. The work will provide a range of social benefits to Australians by informing effective and ethical government and industry policymaking to regulate the reuse and disposal of digital artefacts. In turn, this will help protect Australians and their digital remains from being used in degrading or exploitative ways while still allowing for legitimate uses.												
DP240100689 Olsson, Prof Craig A	**Drivers of ageing and adaptive ageing in middle-aged and older adults.** This project aims to answer crucial questions about how our early years influence our health and wellbeing in middle and later life. Drawing on one of Australia's longest running studies of social and emotional development, we link decades of developmental data collected since 1983 to social, emotional, cognitive and physical wellbeing in participants turning 40 (midlife) and 70 (later life). It will provide insight into important and largely unanswered questions about the way social factors in the first half of life shape our later selves. This study will inform government and health policy targeting ageing populations.	108,171.50	250,455.50	232,895.50	90,611.50	0.00	0.00	682,134.00			New Zealand		
	National Interest Test Statement This project will help answer crucial questions about how our early years influence our health and wellbeing in middle and later life, and what we can do to live a healthy and prosperous life later down the track. Established in 1983 and now spanning three generations of study participants, the Australian Temperament Project is one of Australia's longest running studies of social and emotional development. The next phase of this work is a unique opportunity to collect data on ways in which we adapt to and cope with social and emotional challenges in middle and later life. It will survey study participants who are now aged in their 40s, as well as their parents in their 70s, and connect this to decades of data on social and emotional development collected from these same participants since 1983. It will provide insight into important and largely unanswered questions about the way social factors in the first half of life shape our later selves. This study will directly inform government and health policy for promoting healthy ageing, with a focus on what can be done to build the social and relationship skills from the very beginning of life. The team will continue to support state and federal governments, and peak bodies such as the World Health Organisation and United Nations, to provide world-first insights which can inform how we reduce the pressures on our health and welfare systems that will be needed to support ageing populations in Australia and globally.												
DP240100886 Farrugia, Dr David	**Side-Hustles: Young People and Employment-Adjacent Entrepreneurship** This project aims to understand new working biographies created by young people that combine employment with entrepreneurial activities. 'Side-hustles' are increasingly common amongst young workers, but while entrepreneurship is promoted globally as a policy solution to youth unemployment there is no comprehensive evidence base about the nature of young workers' entrepreneurial activities or the outcomes they experience. The evidence created by this project supports efforts to facilitate youth entrepreneurship, address youth unemployment, and enhance Australia's future labour force. Outcomes include policy papers and reports, a policy	53,181.00	120,672.00	138,543.00	71,052.00	0.00	0.00	383,448.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	forum, academic outputs, and a project website, offering benefit to policymakers, educators and employers. **National Interest Test Statement** Young people are increasingly engaging in small-scale entrepreneurial activities alongside formal employment, or 'side hustles'. Amid increasing employment uncertainty and low wages, entrepreneurship is also being embraced as a policy solution by government. However, the consequences of side hustles are poorly understood. There is a risk that these policies may be ineffective or worsen the economic marginalisation of young people. This project aims to develop a comprehensive understanding of the impact of side hustles on the lives of young workers. Working with government, industry and the non-government organisation sector, we will examine the characteristics of side-hustlers, the nature of their entrepreneurial activities, the strategies they use to combine employment and entrepreneurship, and their experiences overall. A range of outputs will be produced, including a series of public reports, a project website and a public policy forum to ensure that the findings are accessible to policymakers, employers and the general public. The project will provide social and economic benefit by supporting the entrepreneurial aspirations of young workers, promoting economic growth and reducing youth unemployment.												
DP240100895 Gauriot, Dr Romain	**Discrimination in Policing: Evidences from Natural Experiments** Ensuring that institutions are discrimination-free is key for the harmony of a society and the strength of a nation's social contract. This research aims to investigate whether Australian law enforcement discriminates against certain groups and to explore the mechanisms explaining how it decides with whom to strictly enforce the law and with whom to be lenient. This research program focuses on speeding fines as they offer unique natural experiments allowing rigorous exploration of these issues. The expected outcome is a better understanding of discrimination in Australia and the factors explaining it, which should contribute to better policy design and lead to more equitable treatment for all Australians. **National Interest Test Statement** Allowing discretion in the application of the law allows the spirit of the law to be respected while also allowing flexibility in its application. However, this discretion can lead to discrimination based on race, wealth, and gender. It is, therefore, essential to understand how this discretion is applied and whether it leads to discrimination. This research program focuses on the issue of speeding fines, which provides unique real-world data to explore these questions rigorously. By understanding how discretion is applied in this context and whether it leads to discrimination, we can gain valuable insights into the prevalence and impact of discrimination in Australia. While the findings will help us understand discrimination outside this specific setting, studying how speeding fines are issued is important by itself. Driving is part of Australians' daily life; 66.1% of Australians travel to work by car, and 8% have received a speeding fine in the last 12 months. With speeding offences being so prevalent, it is essential to better understand whether all Australians are treated equally when driving over the speed limit. By deepening our understanding of discrimination in Australia, this research program will inform policymaking and could lead to more equitable treatment for all Australians. We will organize workshops that bring together behavioral scientists, policymakers, and other stakeholders to disseminate our findings and promote collaboration on this important issue.	36,475.00	75,172.50	83,710.50	45,013.00	0.00	0.00	240,371.00			Canada		
DP240101175 Hobbs, A/Prof Linda M	**Shifting the Culture of Out-of-field Professional Education for Teachers** This project aims to model an education system that would diversify the expertise of teachers as part of attending to long-term teacher shortage. It responds to a pressing national need for a system of valued and accessible professional education (PE) for out-of-field teachers. The project draws on perspectives from schools, governments and PE providers to expose current practices, cultural norms, and policies; propose an 'ideal' PE ecosystem that	32,708.50	96,365.50	110,851.00	47,194.00	0.00	0.00	287,119.00			United States of America, Germany, Israel, New Zealand		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	values re-specialisation in the core subjects; and develop principles to inform policy and practice needed to attain this ideal. The evidence-based framing of PE will inform efforts by schools, PE providers and policy makers to sustain a highly capable, adaptive and specialised teaching workforce. **National Interest Test Statement** Australian schools are currently facing a teacher shortage. Subsequently, secondary teachers are increasingly required to teach outside their area of specialisation. This project aims to support the diversification of teacher expertise through professional education and re-specialisation to build a more robust, resilient and consistently high-quality education system. The project will integrate perspectives from across the education system to develop a framework for professional education for 'out-of-field' teachers in science, mathematics, English and the humanities. The framework will guide policy settings, education structures and school practices needed to support teachers through continuing subject-focused professional education. A series of workshops across Australian states will ensure the framework is translated for government, school and university contexts, leading to more informed approaches to funding, designing and marketing of professional education for teachers. The scale and scope of this project has the potential to enhance the quality of teaching and learning across Australia by developing policies and practices to produce a highly skilled workforce that will, ultimately, improve the future education of our nation. The project contributes to the priority area of keeping the teachers we have to address teacher shortages from the National Teacher Workforce Action Plan.												
DP240101407 Pringle, Prof Jennifer M	**Zwitterion-based electrolytes for advanced energy technologies** This research aims to develop a new class of electrolyte that is safer, non-flammable and designed to enable excellent performance of high energy batteries made with either sodium or lithium. Through the synthesis of new electrolyte structures that are designed to improve stability and electrochemical properties, and using a range of analysis techniques to understand the material properties, the project aims to solve some of the safety and performance problems that plague existing electrolytes. Expected benefits include new functional energy materials for safer, more reliable energy storage technologies, plus research training, collaborations and materials development capabilities to help position Australia as a global leader in this field. **National Interest Test Statement** Lithium-ion batteries are the most widely used in Australia. However, the electrolytes inside them are flammable and unsafe, and are incompatible with new electrodes being developed to make batteries more powerful. Australia's shift to a green energy economy will rely heavily on batteries, which will be used in everything from electric vehicles to solar energy storage. Using sodium instead of lithium in batteries could provide an incredible alternative, as sodium is cheap and abundant, but this transition requires new electrolytes. This project aims to develop a new class of electrolyte that is safer, non-flammable and designed to function in high-energy batteries made with sodium or lithium. The project will build our understanding of how to improve movement of charge through electrolyte materials to enhance battery performance. Findings will be shared with emerging battery industries and those developing new energy storage technologies through our training centres, collaborators and battery prototyping facility. In a battery-powered future, the potential advantages of these novel electrolytes are diverse, from the economic value of better battery performance to the environmental benefits of more efficient solar energy storage.	88,203.00	183,049.00	159,904.50	65,058.50	0.00	0.00	496,215.00			United States of America, France		
DP240101473 Fomiatti, Dr Renae	**Understanding the role of trauma in alcohol and other drug-related problems** This project aims to investigate the relationship between trauma and alcohol and other drug (AOD)-related problems. Using a robust set of qualitative and ethnographic methods, the project expects to advance international knowledge on	99,010.00	219,045.50	208,596.00	88,560.50	0.00	0.00	615,212.00			France, United States of America, Portugal		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	how experiences of trauma influence AOD consumption, and the diverse factors that shape variation in experience and outcomes for individuals. Expected outcomes include targeted recommendations to improve AOD responses, policy and trauma-informed AOD care, and increased capacity of the Australian health workforce to respond to trauma and AOD-related problems. This should provide significant benefit by reducing the harms, and economic and social costs associated with AOD consumption. **National Interest Test Statement** Problems related to alcohol and other drugs (AOD) such as addiction, relapse, mental illness and overdose have considerable social and economic impact on Australian communities. However, the influence of past trauma in AOD issues is poorly understood. This project will be a world-first comprehensive qualitative study of trauma and AOD problems, conducted by a team of leading AOD scholars. The project will comprise policy and professional resource analysis, in-depth interviews with consumers and health professionals, and field observations of trauma-informed care training. The findings will be used to develop recommendations for innovative social policy and mapping and implementation tools to improve AOD responses and trauma-informed AOD care. Sector-focused feedback and translation workshops will strengthen the relevance of the research outcomes for consumers, practitioners and policy stakeholders. This project will be of social, cultural and economic benefit, as it will provide a rigorous new evidence base to inform community and government responses to AOD-related problems. In doing so, the project ultimately aims to reduce the harm associated with trauma and AODs in Australia.												
DP240101591 Li, A/Prof Jianxin	**Beyond Query: Exploratory Subgraph Discovery and Search System** Exploring co-working user groups in dynamic network data is a vital challenge in many applications, for example, in online education. This project aims to discover new relationships of users and compute their co-working performance in continuous time periods. The outcomes of the project are to design effective subgraph exploratory models, three novel types of subgraph search solutions, and devise a friendly exploratory subgraph search system for supporting the real-time network data analytics. The success of the project will make a significant contribution to the scientific foundation of graph data mining and its applications in data engineering domains, as well as benefiting co-working performance of people in Australian labor markets. **National Interest Test Statement** The problem of user-to-user computing relationships that occur over different continuous time intervals has not yet been explored. This important area of study has the potential to motivate users to work together more effectively and optimise collaboration methods. The project will investigate three time-continuous subgraph query models and develop real-time query services to support dynamic attributed network data analytics. The expected outcomes of this project include a set of effective query models, efficient algorithms, maintenance techniques and strategies, and a prototype evaluation system. This project will contribute significantly to the foundation of big data analytics, artificial intelligence and cybersecurity. It will also have practical benefits such as supporting end-users in making smarter decisions when collaborating, combating the spread of fake news, and optimising item recommendations based on long-term and short-term interactions between users. The prototype system developed as part of this project will be shared as an open-source tool, enhancing the visibility and commercial translation of the research outcomes. This project has the potential to make a significant impact in both the academic and practical realms and contribute to advancing the field of user-to-user computing relationships.	75,000.00	158,500.00	167,000.00	83,500.00	0.00	0.00	484,000.00			United States of America, Germany, Hong Kong (SAR of China)		
DP240101661 Chen, Dr	**Design of novel polymer electrolytes for solid state sodium batteries.** Solid-state sodium-ion batteries can provide a cheaper,	85,000.00	182,500.00	202,500.00	105,000.00	0.00	0.00	575,000.00			Spain, Sweden		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Fangfang	safer, and greener alternative solution to store energy. This project aims to investigate the design of advanced polymer electrolyte materials to address the challenge for the development of all solid-state sodium batteries. New understandings in polymer chemistry, interfacial properties and cell performance will be gained through co-active approaches combining molecular simulations, experimental characterizations, and battery prototyping. This project will provide significant benefits in developing new functional materials, new knowledge, and advanced battery techniques, benefiting Australia's clean energy storage sector. **National Interest Test Statement** If Australia is to develop a future 'green economy' we will need high-performance energy-storage devices to effectively use renewable energy and reduce carbon emissions. As the energy storage needs of industry and households grow, the enormous energy-storage challenge will be difficult to solve with current lithium-ion battery technology alone. The mass production of lithium batteries also raises social and resource issues. This research will provide alternative energy storage technology based on sodium batteries, which will be more economical and sustainable in the long term. The project will bring together world-renowned experts in the fields of polymer synthesis, characterisation and modelling to develop new polymer materials. These materials will be tested in batteries in partnership with industry partners. To maximise uptake, the project findings will be shared through collaborations with major battery industry players, leveraging existing battery prototyping facilities within Deakin University's Battery Research and Innovation Hub and broader industry and research networks established in partnership with the ARC Training Centre for Future Energy Storage Technologies and the Future Battery Industry CRC. The broad benefits to society of improved and diversified battery technology will be both economic and environmental.												
DP240101678 Chen, Prof Ying Ian	**Unlocking exceptional properties through pressure-induced phase transitions** The aim of this project is to produce novel hybrid boron nitride materials by utilizing advanced green techniques of mechanochemistry and high-pressure methods to achieve a phase transition from hexagonal to wurtzite structure. The development of these materials is critical in tackling contemporary environmental and technological issues, particularly those linked to cooling systems in electronic devices and batteries. The outcome of this study will be new nanomaterials with exceptional mechanical, thermal, and electronic properties, as well as new insights into mechanical-force induced green chemistry and an environmentally friendly synthesis process, and help with heat management, energy preservation, and advanced manufacturing. **National Interest Test Statement** The challenge of dissipating heat is a major hindrance in the development of miniaturised electronics. To overcome this issue, there is demand for advanced materials that possess exceptional electronic and thermal properties to reduce heat generation and improve thermal management through passive cooling. This technology is also crucial for reducing energy consumption, which is a pressing global concern. Currently, data centres consume a significant amount of energy, accounting for 3.5% of Australia's total electricity consumption and producing the same amount of CO_2 emissions as the commercial airline industry. A large portion of this energy, around 40%, is used for active cooling, with the waste heat being released into the environment, exacerbating the effects of climate change. This project aims to develop new hybrid materials with enhanced electronic and thermal properties. The project will address the challenge of dissipating heat with an efficient new cooling system based on the new developed materials. We will collaborate with local industries to commercialise the new materials and production technology as we have done previously with other nanomaterials. The outcomes of this project will provide considerable social and environmental benefits for Australian society and industry, including intellectual property, commercialisation opportunities and employment, and reduction of energy consumption and CO_2 emissions.	86,855.50	176,814.50	181,663.50	91,704.50	0.00	0.00	537,038.00			United States of America, Japan, Korea, Republic of (South), France, Scotland		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101812 Miller, Prof Peter G	**Informing intervention responses to violent offenders through data linkage** The project aims to capitalise on new data access capacity to improve knowledge on violent offender pathways and criminogenic needs, such as acquired brain injury, to reduce offending and re-offending. Violence is a major social and health issue nationally and internationally. While there has been substantial investment in treatment/prevention campaigns, rates of violence remain high. Using diverse linked administrative data, we will identify key risk factors and times in trajectories, as well as effective treatment/justice responses. Expected benefits include evidence-based recommendations and engagement with policymakers targeting recidivism, offender screening, treatment, and coordinated violence prevention policy and practice.	69,093.00	137,058.50	149,082.50	81,117.00	0.00	0.00	436,351.00			United States of America		
	National Interest Test Statement Two in five Australian adults have experienced physical or sexual violence since the age of 15. Violence negatively affects mental, emotional, physical and social wellbeing, and the economic impact of violence in Australia is estimated at AU$24 billion per year. This research will use linked data across multiple domains to identify key indicators and outcomes of violent offending. Findings will address critical knowledge gaps, provide new insights into complex offender needs and identify high-risk conditions. This project thus responds to three Australian Government 2018 National Crime Prevention Framework research priorities: (1) community safety, security and cohesiveness; (2) monitoring of localised crime and the development of targeted strategies; and (3) improving the evidence base for crime prevention. Using our extensive networks of policymakers and practitioners, the findings will inform targeted prevention, intervention and reintegration programs to break cycles of violence and improve community safety and wellbeing.												
DP240102177 Liu, A/Prof Dan	**Two-dimensional nanomaterials for wearable zinc ion battery** The project aims to develop a new wearable battery system, based on advanced two-dimensional (2D) nanomaterials with robust energy storage performance and lifespan, for industrial application across the rapidly emerging industries of health monitoring, movement tracking, and smart clothing. The project addresses the critical challenges of control functionalization of advanced 2D nanomaterials for developing wearable energy storage. The research outcomes are expected to result in a scalable approach, a variety of advanced 2D nanomaterials, and wearable new battery system, which will bring significant economic and environmental, social, and cultural benefits to Australia and the world.	79,314.00	162,131.50	169,785.50	86,968.00	0.00	0.00	498,199.00			United States of America		
	National Interest Test Statement There is an urgent need for new materials and technologies to relieve the pressure from the ongoing depletion of fossil fuels and ever-growing energy demands. This project aims to design and develop wearable ‘solid-state zinc batteries’ – which is a type of battery that uses zinc and nano-sized materials to store and release energy with high efficiency. Unlike traditional batteries that use liquid electrolytes, wearable solid-state batteries use solid nano-sized materials to conduct electricity, which makes them safer and more efficient. They are commonly used in wearable devices – like health monitoring, movement tracking, and smart clothing – and are strong, long-lasting and environmentally friendly. Research project outcomes include new ideas in material manufacturing and the creation of low cost and safe batteries. These outcomes will support Australia’s economic development and reduce reliance on non-renewable energy resources for Australian industries. The research will be shared with industry and government to work together to commercialise the battery technology for wide-spread use across Australia. The team will also												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	attend conferences and publish journal articles to communicate their research.												
	Deakin University	851,105.50	1,868,000.50	1,934,240.00	917,345.00	0.00	0.00	5,570,691.00					
La Trobe University													
DP240100465 Hong, A/Prof Yuning	**Next Generation Fluorescent Tools for Measuring Autophagy Dynamics in Cells** This project aims to create new molecular tools for detecting a crucial cell survival process called autophagy. Specifically, this project will develop small molecule fluorescent probes that are specific to autophagy, for the first time, by interacting with the key autophagy marker proteins or cargos. This will allow researchers to visualise and quantify autophagy activity in living cells without disrupting the system, which is not currently possible. This project represents a major technical and knowledge advance that will improve our understanding of autophagy in fundamental biology and ultimately contribute to the development of new intervention strategies for diseases like neurodegeneration and cancers.	90,811.50	186,155.50	180,993.50	85,649.50	0.00	0.00	543,610.00			Scotland		
	National Interest Test Statement Autophagy is a process that allows cells to clean up and recycle unwanted components and is necessary for their survival. Disruptions to this process can cause diseases such as Alzheimer's disease and cancer, therefore understanding how autophagy works is critical. However, current methods to study autophagy are time-consuming, expensive, potentially disruptive to the process, and do not work for all cell types. To overcome these challenges, this project will use innovative chemistry approaches to develop new chemical compounds and techniques that can monitor the natural autophagy process without disrupting cell functions. This will greatly reduce costs and increase efficiency of experiments, enabling us to advance our understanding of autophagy. This will enhance Australia's global research competitiveness and in future create economic benefits through the development of new technologies that can be used for drug development. The team has a track record of successfully developing new reagents that have been widely adopted by both industry and academia, as well as setting experimental standards that have been embraced by the field. In addition to advancing scientific understanding, this project will train the next generation of scientists with multidisciplinary skills in chemistry, biology, and biotechnology. The findings of the project will also be promoted to the public via the general media.												
DP240102275 Ellinghaus, A/Prof Katherine	**Aboriginal Exemption: Truth-telling, History, and Healing** This project aims to develop accessible, Indigenous-led knowledge about little known twentieth-century Australian policies that caused pain and dislocation in Indigenous communities. Expected outcomes will include an anthology of family stories, school curriculum materials, symposia, and methodological articles. Benefits include empowering descendants to access archival information about exemption in culturally safe ways, disseminating culturally appropriate histories, financial support for Elders acknowledging their time and expertise, and a model of collaboration in which Elders lead Indigenous and non-Indigenous historians to undertake urgent history-making.	117,696.00	241,029.50	249,420.50	126,087.00	0.00	0.00	734,233.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement At a time when most Indigenous Australians were unable to access education, health services, housing and employment, Aboriginal exemption policies offered some Indigenous individuals a means of accessing benefits readily available to non-Indigenous Australians, but also led to family dislocation and lost kin, culture and language. Motivated, initiated and led by two Indigenous Elders, this research will contribute to Australia's national interest by engaging in truth-telling about the effects of these policies, an aspect of our past that is little known. This project has social benefits in that it will assist families affected by exemption to research their family history. It will also educate mainstream Australians about our nation's history of attempts to assimilate Indigenous people, leading to a better understanding of the diversity of Aboriginal identities today. The project will provide extensive and timely cultural benefits by enabling Indigenous people to tell their own stories and to share these within Indigenous communities, as well as with the wider Australian community. Elders will use their networks and skills to translate and direct appropriate academic findings into community contexts and ensure that the research is transmitted in relevant, accessible and culturally appropriate ways.												
DP240102532 Collin, Prof Shaun P	**Chemoreception in fishes: Anthropogenic impacts on brain and behaviour** This project aims to assess the impacts on fishes of increasing numbers of chemical pollutants entering Australia's waterways. Critical contaminants effect the chemosensory capabilities of endemic fishes that are commonly found in Australia and play an important role in fisheries and coastal biodiversity. Using a multidisciplinary approach, the study will interrogate the fundamental impacts of chemical pollutants on the detection, perception and behavioural reactions to a herbicide, a pesticide and a metal, and their impacts on finding food, avoiding predation and finding mates. Significant benefits include the timely intervention and implementation of improved environmental management strategies and policies.	71,481.00	189,255.00	232,816.00	219,810.50	104,768.50	0.00	818,131.00			United States of America, Sweden		
	National Interest Test Statement In fishes, the ability to sense odours is critical to their survival but we know little about the effects on this of the rapidly increasing amounts of pollutants. This project will investigate how Australian fishes that are important to both recreational and commercial industries detect, perceive and react to water-soluble chemical pollutants that are entering our waterways. We will target three contaminants of high concern; a herbicide, a pesticide and a metal (copper), all of which are present currently in Western Port at levels that exceed recommended values. Using innovative techniques to assess fish tissues, physiology, and behaviour, this study will improve understanding of the effects of chemical exposure that occur well before reaching lethal endpoints. The results will benefit the economic (fisheries), environmental (ecosystem health) and social (coastal development) aspirations of the Australian Government and inform the timely intervention and implementation of improved management strategies and policies. Research outcomes will be communicated to Melbourne Water, the Department of Energy, Environment and Climate Action and the Victorian Fisheries Authority via face to face meetings, presentations and sharing of publications.												
DP240103209 Mielke, Dr Lisa A	**Intraepithelial lymphocyte development and function in the intestine** This study aims to better understand the homeostatic maintenance and essential repair processes in the intestine. This project will generate new knowledge of how immune cells of the intestine, known as intraepithelial lymphocytes (IELs), engage with intestinal epithelial cells, neurons and commensal microbes to promote homeostasis and repair. Expected outcomes of this project will be identification of new molecules for future drug and vaccine development to improve gut health and vaccination in mammals. This should provide significant benefits to the Australian population and livestock industry through improved protection against cancer, intestinal infections	107,423.00	201,437.50	177,008.00	82,993.50	0.00	0.00	568,862.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	and increased productivity. **National Interest Test Statement** As the centre of our digestive system, the intestine suffers daily damage from chemicals, carcinogens and pathogens in the food we eat, and must constantly repair itself to maintain proper function. Though vital to our survival, these repair processes are poorly understood. Recent evidence suggest that immune cells play a key role. Using innovative techniques that work at the level of molecules, this project will uncover the critical communication networks between immune cells, intestinal lining, and gut bacteria that control these repair processes. The knowledge generated by this research will allow Australia to develop next generation therapeutics based on nanotechnology and RNA, a basic building block of all cells and used in vaccination. This new industry, predicted to be worth more than $2 billion by 2025, represents a considerable economic and job-creating opportunity for Australia, providing new avenues to protect the Australian population and livestock industry through improved protection against cancer and intestinal infections leading to increased productivity. Research findings will be share with the broader community through open research forums, press releases and consumer meetings. We will also pursue industry partnerships to commercialise the research and attend forums to communicate our work to policy makers.												
DP240103334 Xiang, Prof Wei	**Fast Reconstruction and Real-time Rendering of Immersive Light Field Video** This project aims to develop new learning-based methods for reconstructing and rendering 3D immersive videos from multi-view 2D videos. The project expects to generate new knowledge in the areas of data mining, multimedia, pattern recognition and deep learning. Expected outcomes of this project include new deep neural networks to represent 3D videos, neural methods for high-fidelity video rendering and efficient 3D video reconstruction and rendering algorithms. This should provide significant benefits to a diverse range of practical applications, such as autonomous driving, virtual reality, healthcare, advanced manufacturing, and many other 3D applications.	81,695.50	159,941.00	161,080.00	82,834.50	0.00	0.00	485,551.00			United States of America		
	National Interest Test Statement This project develops methodologies to construct 3D immersive videos from multi-view 2D videos. Existing approaches are hampered by an inability to achieve both speed and quality for practical applications, which this project aims to overcome by way of novel deep learning-based methods, and new reconstruction and rendering algorithms. The practical applications of such technology are extremely broad, and can provide diverse economic, health, and cultural benefits to the Australian community. The expected outcomes can be used in autonomous driving, robotics and automated manufacturing that are reliant on accurate 3D environment perception, which addresses the national priority “Advance Manufacturing”. Entertainment, tourism, and education industries can be enabled to provide immersive experiences to attract and engage audiences. The proposed research also addresses the national priority of “Health” as 3D video conference systems based on this project can deliver benefits in telemedicine, and the invented methods can be used for 3D medical imaging to improve the accuracy of diagnosis. This can ultimately lead to better healthcare outcomes for Australians. Moreover, artists and filmmakers can utilise this innovative approach to create engaging cultural experiences. To achieve these outcomes, the research team will communicate and engage with industry stakeholders and adapt the developed solutions to different applications to maximise their practical benefits.												
	La Trobe University	469,107.00	977,818.50	1,001,318.00	597,375.00	104,768.50	0.00	3,150,387.00					
Monash University													
DP240100048 Webb, Prof Geoffrey I	**Efficient and effective methods for classifying massive time series data** This project aims to transform the theory and practice of time series classification. The current state of the art cannot handle the massive numbers of time series that describe many critical problems facing humanity, such as disease transmission and climate change. This project seeks to	84,155.00	170,810.00	175,810.00	89,155.00	0.00	0.00	519,930.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	develop methods that can analyse dynamic processes at global scale, delivering the most accurate classifiers feasible within a given computational budget. Expected outcomes of this project include efficient, effective and broadly applicable time series classification technologies. This should provide significant benefits to myriad sectors, transforming data science for time series problems and supporting innovation in industry, commerce and government.												
	National Interest Test Statement												
	Artificial intelligence is transforming all sectors of Australian society, through such developments as smart phones, devices, and cars; travel navigation; industrial automation; forecasting infection spread, prevalence and outcomes; and the genetic analysis that underpins new and refined vaccines. Current artificial intelligence is poor at accounting for change over time. This project aims to create new artificial intelligence technologies that better understand change over time and can use that understanding to better inform decisions and actions. In particular, it seeks to develop technologies that can analyse the massive quantities of time varying data that can potentially be brought to bear on critical global challenges such as the spread of diseases and climate change. The project will develop new widely-applicable AI technologies that can best use large quantities of time varying data to greatest effect. This will unlock value and provide competitive advantage for Australian industry, commerce, defence, governance, research and health by allowing them to better understand and exploit their large and growing time varying data assets.												
DP240100069 Gasevic, Prof Dragan	**Assessments for writing with generative artificial intelligence** This project aims to develop a novel assessment framework for writing with generative artificial intelligence—a new technology capable of producing text with humanlike fluency. This project endeavours to produce new knowledge at the intersection of learning analytics, the learning sciences, and educational technology using innovative methods for data capture and analysis. Expected outcomes of this project include the first valid, feasible, and reliable framework for assessing writing composed with the help of artificial intelligence. This should provide significant benefits to (a) writing assessment in higher education, (b) student learning, and (c) our understanding of collaborations between humans and artificial intelligence.	98,037.50	215,132.50	220,918.50	103,823.50	0.00	0.00	637,912.00			Finland, Serbia		
	National Interest Test Statement												
	Our project addresses the pressing gap in knowledge regarding the valid and feasible assessment of writing with generative artificial intelligence—a technology that is poised to become ubiquitous in education and the workplace. Economically, the project will improve graduate employability by supporting educators to teach with—and students to learn with—generative artificial intelligence. We will achieve this by developing a novel assessment framework and deployable assessment system that teachers can use to evaluate and improve student writing practices. Commercially, this project will enable the development of the next generation of artificial intelligence and data science-driven products to advance the education technology industry. The industry will benefit from our design principles, models, and blueprints to develop technologies that optimise the assessment of products and processes augmented by artificial intelligence. Socially, the project will offer validated approaches that can inform policies and practices in higher education related to assessment in this new age of artificial intelligence. We will promote our project beyond academia via webpages, podcasts, news media, and educational trade shows and conferences.												
DP240100102 Priebbenow, Dr Daniel	**Data Driven Discovery of New Catalysts for Asymmetric Synthesis** This project aims to discover new catalytic strategies for the synthesis of valuable nitrogen-containing molecules. An innovative approach combining statistical modelling	75,000.00	155,000.00	155,000.00	75,000.00	0.00	0.00	460,000.00			Canada		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	techniques and chemical synthesis tactics will be used to establish a unique platform for predictable catalyst design that significantly accelerates the discovery process. As a result, new organometallic catalysts that efficiently convert simple and readily accessible chemical building blocks into complex chiral amine derivatives in a safer and more cost effective manner will be identified. These new catalytic strategies will be of significant utility, enabling the invention and more sustainable manufacture of agrochemicals, life-saving medicines, and functional materials.												
	National Interest Test Statement This project will combine advanced chemical synthesis technologies and statistical modelling techniques to discover new catalytic strategies to manufacture valuable chiral amines. As current manufacturing processes are energy intensive and produce significant amounts of waste, this project is expected to deliver safer, more energy efficient and more sustainable strategies to manufacture amine derivatives from common feedstock chemicals. In addition to reduced energy consumption and increased sustainability, the innovative new catalytic strategies will afford access to functional molecules that are inaccessible using existing technologies, underpinning the invention of new agrochemicals and pharmaceutical agents. The chemical sector is one of the largest manufacturing sectors in Australia, contributing $38 billion annually towards Australia's GDP and employing over 60,000 people. Throughout this project we intend to work closely with this sector to ensure that the new manufacturing strategies can be adopted by local industry, delivering global competitive advantage that further enhances Australia's prosperity. In alignment with recent efforts to consolidate Australia's sovereign manufacturing capacity, the new catalytic strategies will also drive the invention of new advanced materials including polymers, composites, pigments, and fuels, delivering broad social and economic benefits across Australia's electronics, construction, pharmaceutical and agricultural sectors.												
DP240100111 Selwyn, Prof Neil	**Supporting teachers and teaching in the age of Artificial Intelligence** This project aims to investigate teacher capabilities to respond to, and engage with, Artificial Intelligence (AI) tools in their classrooms and online teaching. This project expects to generate significant new knowledge about teacher workforce development to work productively alongside AI and other automated technologies. Expected outcomes include insights into technical, organisational and social issues surrounding the deployment of AI tools in schools, and the development of models of AI best practice and professional learning. This should provide significant benefits such as improved classroom outcomes and better use of technical infrastructure investment.	51,699.00	121,374.50	137,660.50	67,985.00	0.00	0.00	378,719.00			United States of America, England, Sweden		
	National Interest Test Statement This project will investigate how Australian secondary school teachers are beginning to make use of Artificial Intelligence (AI) technologies in their work, and identify ways of supporting more effective future take-up of AI technologies by teachers. Amidst growing policy, professional and public discussion of the educational implications of AI technologies, this project addresses the need for in situ school-based research to test the largely speculative claims being made this emerging genre of digital technology. The project will result in innovative professional learning resources, policy guidelines, and product design protocols that will support the more effective future integration of AI tools into schools and classroom. This will be of direct benefit to Australian schools and the broader education sector, as well as Australian software developers and EdTech industry. The project will also make important contributions to ongoing policy debates over developing 'AI literacy' within the Australian education workforce, and policy oversight in terms of the take-up of AI tools in the public sector. The project will culminate in a series of research engagement and translation activities with education and IT industry end-users to ensure that project outcomes are adopted.												
DP240100120 Junkers, Prof	**Data Driven Polymer Synthesis** This project aims at full digitalization of the synthesis of high-added-value materials via combination of chemistry	115,335.50	205,020.50	152,685.00	63,000.00	0.00	0.00	536,041.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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Dr Tanja	with data science and by constructing a fully automated robotic synthesis machine. The project expects to provide the data basis for advanced artificial intelligence application and its implementation. If successful, this will enable the prediction and automatic optimization of chemical reactions, providing rapid and more precise development of new materials. This project will provide the benefit of significantly increasing the ability of Australian industry to use novel digital chemistry tools and to create revenue by faster product development, aiding in securing the over 60 000 jobs in this industry in Australia.												
	National Interest Test Statement												
	Digitalization and robotics have vastly changed lives in the past decades. Chemistry, especially in the area of development of new compounds, is until today fully manual. This project aims at full digitalization of the synthesis of high-added-value materials via combination of chemistry with data science. We will construct a fully automated robotic synthesis machine which in turn will provide the data basis for advanced artificial intelligence tools that can otherwise not be accessed today. If successful, this will enable the precise prediction and rapid automatic optimization of chemical reactions, hence providing significantly faster and more precise development of new materials. This project directly increases the ability of the Australian chemical industry to use novel digital chemistry tools and to create revenue by faster product development, aiding in securing the jobs in this industry in Australia.												
DP240100121	**Sustainable Reversible Polymerisation**	95,585.50	193,020.50	159,935.00	62,500.00	0.00	0.00	511,041.00			Switzerland		
Junkers, Prof Dr Tanja	This project aims to address the problem of the current lack of efficient chemical recyclability of polymers. For the majority of polymers, no methods exist so far that are scalable and economic at the same time. To reach this aim, we will utilise a mixture of clever chemical concepts with continuous flow engineering. This project expects to generate new knowledge in the area of depolymerisation and chemical recycling methods. The expected outcome of this project is a scalable process and its practical demonstration for full chemical recycling of various polymers used in everyday applications. This will provide a benefit to society as it allows to tackle plastic pollution problems, and creates avenues to green methods in plastic recycling.												
	National Interest Test Statement												
	This project aims to address the problem of the current lack of efficient recyclability of polymers. For the majority of polymers, today no methods exist that are scalable and economic to retrieve the starting compounds from a plastic material, which would - if available - enable a circular plastic economy. To reach this aim, we will utilise a mixture of clever chemical concepts with continuous flow engineering. This project expects to generate new knowledge in the area of depolymerisation and chemical recycling methods. Expected outcomes of this project are a scalable process for full chemical recycling of various polymers used in everyday applications. This will provide a direct benefit to society as it allows to tackle plastic pollution problems, and creates avenues to green methods in plastic recycling. The ultimate goal of plastic recycling is reaching a full circular economy, which will only be reached if methods are identified to deconstruct current plastic materials in a chemical way into its original constituents.												
DP240100158	**New methods in network economics to study environment-friendly behaviours**	72,203.50	148,462.00	91,722.50	15,464.00	0.00	0.00	327,852.00			Sweden, China (excludes SARs and Taiwan),		
Zenou, Prof Yves	This project aims to develop two new methodologies for measuring how people interact with each other and how one’s peers affect their outcomes. The project expects to												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	test these new ground-breaking models for investigating the effect of peers and networks on environmental issues, such as recycling behaviours. The anticipated outcomes of this project include new theoretical and empirical advancements for studying the economics of networks and peers for better policy design. Benefits include clear policy recommendations to motivate environment-friendly behaviours.										Canada, Germany, England, United States of America		
	National Interest Test Statement Research shows our behaviour is influenced by those around us, particularly those close to us, like friends, neighbours, and colleagues. However, there are significant gaps in this peer-effect research that make it difficult to predict what people will do in a given social situation. With environmental issues increasing in Australia, better policies are needed to motivate positive individual and collective action. This project will develop and test new improved models to understand people's interactions and influence on recycling behaviours. The expected outcome of this project is to enable more effective policy design to support change through improved recycling behaviours. The translation pathway includes formal submissions to government commissions dealing with issues of health, environment, and education; media engagement, and stakeholder forums to disseminate research outcomes to a policy audience. The potential future benefits of using this method to support the changes required to address other societal challenges in Australia, and globally, is immense.												
DP240100198 Wood, Prof David R	**The Global Structure of Sparse Networks** Graph theory (the mathematics of networks) models many real-world problems and is a major area of modern mathematics. This project aims to investigate the global structure of graphs using product structure theory, which is a recent breakthrough method that has been the key to solving several open problems. The goal is to extend the reach of product structure theory and to discover new fields of application, especially in theoretical computer science. It is expected that the tools developed will be widely applicable, for example, in network optimisation. The project aims to build collaborations between Australian researchers and world-leading international mathematicians, and provide advanced training for talented young researchers.	73,593.00	152,186.00	117,862.50	39,269.50	0.00	0.00	382,911.00			Canada, Belgium, Poland, United States of America, England		
	National Interest Test Statement Networks are a pervasive element of modern life: communication networks, social networks and biological networks are a few examples. This project aims to study deep problems in the mathematics of networks. The outcomes will include major advances on important open mathematical problems that will enhance Australia's already strong reputation for research excellence in pure mathematics. The project will strengthen existing collaborations and foster new ones between researchers in Australia, Canada, United Kingdom, Belgium and Poland. Advanced training for talented young researchers will be provided in an area that is foundational to modern information and communication technologies. The project will provide a deep understanding of the global structure of networks. The tools developed will have widespread and long-lasting impact on future research across mathematics and computer science, as well as potentially having applications in network optimisation algorithms for use in any of the fields mentioned above, especially for optimisation in the road and transport industries. Outcomes from the project will be disseminated through publications in leading mathematical journals and presentations at major international conferences.												
DP240100330 Peters, Dr Anne-Marie	**Early-life climate sensitivity: direct and indirect mechanisms** This project aims to investigate how climate change threatens animal populations by determining the mechanisms causing DNA damage (short telomeres) in nestling birds growing up in hot conditions. Telomeres are	93,894.50	214,487.50	237,457.50	116,864.50	0.00	0.00	662,704.00			Netherlands		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	biomarkers of individual life expectancy, and short telomeres in young birds predict a decline in future population viability. Our project aims to determine the importance for heat-induced telomere shortening of: (1) nestling heat stress responses; (2) inheritance of heat-shortened sperm telomeres; and (3) parental buffering of heat effects. Expected benefits include enhanced reliability of climate change predictions and improved ability to identify climate change mitigation strategies before population declines are evident. **National Interest Test Statement** As climate warming accelerates, life-long adverse impacts of heat exposure in young animals are of great concern, but ill-understood, because impacts of early-life adversity are often not apparent until much later in life. We recently identified a universal biomarker for early detection of such hidden climate legacies in young birds - telomeres (DNA caps that protect all chromosomes). Here we apply this novel biomarker to investigate the threat of early-life heat exposure on population viability. Our model species is an endangered bird living along waterways in Australia's tropical savanna. We previously found that young growing up during hot conditions have damaged (short) telomeres, and birds with short telomeres die younger, with fewer descendants, which threatens population persistence. Our study aims to determine the biological mechanisms by which hot temperatures cause damaged telomeres and the environmental features that can mitigate this. Benefits of our project include more accurate predictions of the threat of climate change for wildlife and development of climate mitigation strategies before population declines occur. Because our study species is an indicator species for health of habitat along savanna waterways, our outcomes are particularly relevant for those ecosystems, which are essential climate refuges for wildlife in tropical savannas. We will therefore engage with local and regional conservation practitioners to design conservation strategies.												
DP240100345 Jeanes, Prof Ruth	**United on the field? Enhancing equity and inclusion in community sport** The project aims to deepen understanding of how equity and inclusion policies within community sport can be transformed to address inequities in participation. The project expects to generate new knowledge using intersectional policy-based analysis to inform the development of more effective policy responses to systemic, multi-layered inequities in the sports sector. Expected outcomes include increased capacity within the sport sector to address exclusion and widen participation. This will result in significant social benefits, such as providing fair access to community sports for marginalized communities, and economic benefits, by reducing the health costs associated with low physical activity. **National Interest Test Statement** Despite several decades of investment aimed at addressing inequities in sports participation in Australia, community sport continues to exclude, discriminate and marginalize diverse populations. Sports policymakers recognize transformative approaches are necessary to progress equity and inclusion in sport, that respond to multiple forms of disadvantage and discrimination. However, there remains uncertainty as to how policies and practices can respond to inequities in meaningful and transformative ways. A failure to progress beyond current approaches to address inequities in community sport participation is problematic in the context of social justice and health promotion agendas. The project will increase our understanding of how equity and inclusion policies in sport can be advanced to address multiple forms of disadvantage and exclusion by providing practical recommendations to better address intersectional marginalization more effectively within the sport sector. The project will provide significant economic and social benefits by assisting sports policymakers to more effectively harness the physical, mental and social health value of sport for a more diverse cross-section of society. The project findings will enhance the capacity of the sport sector to address the profound negative impacts COVID-19 has had on the mental and physical health of Australians.	66,478.00	131,484.50	135,999.00	70,992.50	0.00	0.00	404,954.00			Canada, United States of America, England		
DP240100491	**New insights into female reproductive tract formation and tubulogenesis.**	82,870.50	164,716.00	171,528.50	89,683.00	0.00	0.00	508,798.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Smith, A/Prof Craig A	Aims: This project aims to improve our understanding of female reproductive tract formation by studying its developmental origins. Most of the female reproductive tract derives from a pair of embryonic tubes called Müllerian ducts, the formation of which is incompletely understood. Significance: Using chicken and mouse models and innovative genetic approaches, the project will undercover novel genes and cellular pathways in Müllerian duct formation. Expected outcomes: This work will enhance knowledge in the biological sciences, in the area of female reproduction and how tubes form in biological systems. Benefits: It will train research scientists, develop collaborations and enhance Australia's high standing in the field of reproduction. **National Interest Test Statement** (1) This project is about the identification of genes that control formation of the Müllerian ducts, paired embryonic tubes that give rise to the female reproductive system. (2) It will address current gaps in our knowledge on how genes and cellular processes regulate female reproductive tract formation during embryonic life. (3) The female reproductive tract forms during embryonic life as a pair of simple tubes. This project will shed new light on how tubes form in other biological systems. (4) It will benefit Australia by enhancing knowledge of basic cell biology, informing areas such as reproduction and organ regeneration. It will also train highly skilled scientists, upon which our research capacity, future discoveries, and prosperity are based. (4) Translation potential and outcomes. This work will be of value to areas such bioengeneerring, stem cell biology and growing replacement organs. It will do so by deepening our understanding of how tubes form in biology. Tubes are an essential component of many organs, from the testis and kidney to lungs and gut. This project will provide new insights into how tubes form, and how tube development might be manipulated for developing stem cell therapies and for organ bioengineering.												
DP240100497 Wang, Prof Huanting	**Unlocking the ion selectivity of lithium superionic conductor membranes** This project aims to address a longstanding challenge in designing advanced membranes to enable sustainable lithium refining by unlocking the ion selectivity of lithium superionic conductors. This project expects to generate new knowledge in the areas of membrane science and emerging nanoionics by using interdisciplinary approaches. Expected outcomes of this project include a novel class of lithium separation membranes and their fabrication techniques. This should provide significant benefits in improving lithium extraction and recycling efficiency, reducing their environmental impact and building the research capacity in advanced membrane manufacturing and critical mineral refining in Australia. **National Interest Test Statement** Australia is one of the largest lithium producers and exporters in the world. Current lithium refining and extraction processes from various sources such as hard rocks and brines are of low efficiency, energy intensive and environmentally damaging due to heavy chemical uses. New refining technology is urgently needed to address these longstanding challenges. This project aims to address this technology gap by unlocking the ion selectivity of lithium superionic conductors and develop advanced membranes that can efficiently filter out lithium salts, enabling sustainable lithium refining and extraction. The proposed research represents a paradigm shift in developing a new technology for the lithium industry. In addition, the novel membranes are expected to become a key part of the technological solution to environmentally benign lithium extraction from large volumes of spent lithium batteries. This project expects to generate new intellectual property for commercial development and adoption of advanced membrane technology, contributing to the growth of Australian manufacturing and resources industries and the reduction of carbon emission. It falls squarely within the Australian Government's current Science and Research Priorities of Advanced Manufacturing, Resources, and Energy. The proposed research will help Australia to become a world leader in lithium refining	98,335.50	204,335.50	211,843.00	105,843.00	0.00	0.00	620,357.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	technology development.												
DP240100569 Levinsen, A/Prof Jesper F	**Polarons in flatland** This project aims to generate new theories of excitons (the solid-state analogue of hydrogen atoms) in charge-doped atomically thin semiconductors. Such theories are urgently needed to describe the response to external probes, such as electric fields, of a range of novel materials that have emerged in recent years. The novelty is to treat the behaviour of semiconductors as a quantum impurity problem, where the excitons become modified by the surrounding electrons to form new types of particles. A greater understanding of the impurity problem in 2D materials would ultimately facilitate their use in emerging technologies that combine electronics with photonics, for use in ultra-low-power devices such as photodectectors, LEDs, and lasers.	73,640.50	147,861.00	115,374.50	41,154.00	0.00	0.00	378,030.00			United States of America		
	National Interest Test Statement Quantum technologies are expected to shape the global economy and are forecast to form a $2.2 billion dollar industry in Australia by 2030 according to the CSIRO quantum technologies road map. However, to secure its place in this emerging global industry, it is critically important for Australia to sustain and grow its investment in the latest quantum capabilities. This project aims to transform our understanding of a new class of quantum materials: two-dimensional semiconductors that are just one atom thick and which form part of the materials science revolution initiated by the discovery of graphene. This research will generate new theoretical and computational tools for manipulating these quantum materials with light, thus enabling their potential application in emerging technologies such as quantum sensors and quantum simulators. The project takes cutting-edge theoretical expertise unique to Australia and combines it with world-class experiments that can benchmark and test the theoretical predictions. The research outcomes will be promoted beyond academia through outreach activities in order to foster the future quantum workforce.											
DP240100601 Michaels, A/Prof Paula A	**Medical Internationalism: Cuba and Eastern Europe, 1959-1999** This project aims to understand the history of medicine as an instrument of soft power during and after the Cold War. Taking Cuba as a case study, it expects to generate new knowledge about the socialist East's fight to win ‘hearts and minds’ in the global South by analysing the professional and interpersonal relationships that developed among Cuban, Soviet, and Czechoslovak medical students, clinical practitioners, researchers and public health officials. Expected outcomes include refined methods of transnational history and medical history. This should provide significant benefits, such as enhancing Australia's visibility as a site of historical discovery and innovation, and offering historical context for contemporary diplomacy.	87,423.50	232,136.00	202,969.00	77,076.00	18,819.50	0.00	618,424.00			Czech Republic, Cuba, England, Russian Federation, Hungary, United States of America		
	National Interest Test Statement Cuba has recently expanded its use of medicine to project influence in the Asia-Pacific. As a gesture of goodwill, it has trained medical workers in Nauru and other Pacific Island States. In response to the current pandemic, it is donating 10 million doses of the vaccine to Vietnam. To manage Australia’s role in the region, we need a better understanding of Cuba’s long and significant history of medicine's instrumental use. This project fills this knowledge gap by revealing the history of medical cooperation and exchange between Eastern Europe and Cuba (1959-99). This project will benefit Australians by offering an opportunity to reflect on and assess Australia’s contemporary practice of the mobilisation of medical personnel, goods, and knowledge to promote our national interests abroad. The support of Eastern Europe for Cuba, and Cuba’s own effort to offer aid elsewhere in the global South, is the quintessential success story of											

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	medicine as a diplomatic tool A deeper understanding of these efforts' successes and failures offers clues for how to maximally leverage these assets to promote goodwill abroad in our own foreign policy. By bridging an analysis of state policy with the lived experience of state agents on the ground, this study suggests a template for assessing the contemporary efficacy of Australia's regional policy initiatives. The findings will be communicated to the wider Australian public via writings of engaged scholarship to appear in popular venues.												
DP240100793 Manias, Prof Elizabeth	**Engaging residents and families in aged care facilities** This project aims to investigate resident and family engagement in communicating about medicines that affect the mind, emotions and behaviour, by developing and testing creative strategies in aged care facilities. This project expects to generate new knowledge about resident and family communication within a dynamic context of sociocultural, environmental and interpersonal challenges and opportunities. Expected outcomes of this project include enhanced capacity to enable resident and family participation in bridging communication gaps. This should provide significant benefits, in terms of increased understandings about how and under what circumstances, medicines decision making can occur with residents and families in diverse situations.	70,809.50	139,444.50	161,160.00	92,525.00	0.00	0.00	463,939.00			England, Northern Ireland		
	National Interest Test Statement Breakdown in communication and lack of engagement are often the source of medicine-related problems in aged care facilities, which cause major harm and involve large costs of care. Major problems are often experienced with medicines that affect the mind, emotions and behaviour in aged care facilities, which are called psychotropic medicines. New knowledge will be developed in understanding the different communication situations that are faced by residents and their families in aged care facilities in the use of psychotropic medicines. The project will be undertaken in different geographical locations, and in various aged care facilities. The project will incorporate the views of residents and their families with diverse characteristics, including those of non-English speaking backgrounds. The outcomes of this broad range approach will therefore benefit the wider Australian community. The project will determine by whom, how, and under what circumstances, engagement with residents and families can take place. Strategies will be identified and tested that focus on upholding the rights of residents and their families in having a say in managing psychotropic medicines, especially in the cases where safer alternatives are available. Engagement of residents and families in psychotropic medicine decisions is likely to result in reduced medicine-related problems and lower costs in care.												
DP240100970 Wong, Dr Benjamin	**Implications of Global Economic Forces for Domestic Monetary Policy** The project aims to quantify and understand the extent to which international factors affect key macroeconomic variables such as inflation and interest rates in open economies. The aims will be achieved through the development and application of new macroeconomic and econometric models. Expected outcomes are new insights and policy recommendations on how to appropriately conduct monetary policy for an open economy such as Australia. This should provide significant benefits to the broader Australian economy through the conduct of suitable policy by institutions such as the Reserve Bank of Australia.	63,960.50	129,518.50	90,558.00	25,000.00	0.00	0.00	309,037.00					
	National Interest Test Statement Australia is an open economy which is not immune to developments within the broader global economy. Recent macroeconomic events such as high inflation and rising interest rates are not just isolated to Australia, but linked to the global surge in inflation and recent movements in global interest rates. By seeking to quantify, and thus understand, the implications of these international developments on open economies like Australia, the research will contribute to												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	the policy debate, and in turn, better macroeconomic policy. In particular, the outcomes from the project will be important for institutions such as the Reserve Bank of Australia as they formulate a policy response to dealing with recent economic events that have such a clear international dimension.												
DP240101021 Xiao, Prof Erte	**Changing Institutions to Mitigate Gender Leadership Gaps: Power of Defaults** This project aims to improve diversity in organisations by investigating a simple yet novel institutional change that can increase women's participation in leadership. This involves a change in the default used for leadership selection, from an opt-in to an opt-out mechanism. This project expects to generate new knowledge in the area of diversity and inclusion by showing how appropriate choice of defaults can reduce labour market gaps and inequality. Expected outcomes include understanding mechanisms underlying the gender default effect both in the short and long run which will help identify appropriate interventions that can be scaled up. Insights gained should provide significant benefits by improving workplace diversity and productivity.	62,205.50	126,672.00	109,994.50	45,528.00	0.00	0.00	344,400.00			Singapore		
	National Interest Test Statement Gender inequality in key leadership roles is a critical problem across almost all industries in Australia. Despite the resources allocated to achieve gender equality, the glass ceiling remains intact and continues to be an impediment for the Australian economy. Evidence shows that it significantly reduces national productivity, economic growth, and living standards. This project confronts the challenge of gender inequality by studying how biases embedded in institutional structures, specifically in leadership selection processes, can contribute to the creation of gender gaps. By using insights from behavioural economics and experimental methodology, we aim to investigate a simple yet novel institutional change, from an opt-in to an opt-out system, that can increase women's participation in leadership positions. Successful institutional change requires an in-depth understanding of its short-run and long-run implications. The insights we gain through this research will show how gender gaps can be mitigated through appropriate institutional change. The results will have immediate implications for industry practitioners and policy makers. They will benefit current and future generations of Australians by overcoming an institutional factor that contributes to gender gaps. We plan to communicate our results through workshops and policy papers to government, community, and industry organisations, such as the Workplace Gender Equality Agency and Diversity Council Australia.												
DP240101048 Horsley, A/Prof Daniel J	**Fractional decomposition of graphs and the Nash-Williams conjecture** Nash-Williams' conjecture is a famous unsolved problem about decomposing graphs (abstract networks). Breakthrough results achieved in recent years have shown that the conjecture, along with other major graph decomposition problems, could be solved if only more were known about fractional decomposition. This project aims to clear this bottleneck to progress by dramatically expanding the state of knowledge on fractional decomposition. Expected outcomes include major progress on Nash-Williams' conjecture and related graph decomposition problems. This should enhance Australia's research reputation in pure mathematics and provide benefits in downstream applications areas including statistics, data transmission, and fibre-optic networks.	38,166.50	110,119.50	142,096.00	104,439.50	34,296.50	0.00	429,118.00			Canada, England		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	This project aims to make breakthroughs on important mathematical questions regarding graph decomposition. Roughly speaking, graph decomposition involves dividing abstract networks into smaller networks. Questions of this type have significance in many vital real-world applications including in the design of efficient and powerful statistical studies, in data transmission and compression, and in managing traffic in fibre-optic networks. We expect our work will lead to significant benefits, including the following. - A better understanding of graph decomposition through more powerful results and techniques that will have real impact on future research. - Major advances on famous open mathematical problems that will add to Australia's already strong reputation for research excellence in pure mathematics. - More efficient algorithms for tackling graph decomposition problems that may be of use in the applications mentioned above. - Strengthening existing collaborations and fostering new ones between researchers in Australia, Canada and the UK. - Cutting edge experience and training for a number of young researchers in an area that is foundational to modern information and communication technology. Outcomes from the project will be disseminated through publications in leading mathematical journals and presentations at major mathematical conferences.													
DP240101081 Fiorenza, A/Prof Luca	**From foraging to farming. Human adaptations during major transitions** This project aims to investigate the causes that led to the human demographic explosion occurred during the Neolithic Revolution by analysing dental tissues through cutting-edge methods. This project expects to generate novel insights about the diet, health and weaning practices in Mediterranean human populations from the last 30,000 years. Expected outcomes of this project include the creation of new data on early life dietary transitions in archaeological populations, enhancing capacity to build interdisciplinary collaborations, and refining methods and concepts to study the diet of the past. This should provide significant benefits to Australian research in evolutionary anthropology, nutrition and in dentistry.	146,925.00	253,055.00	211,983.00	105,853.00	0.00	0.00	717,816.00			Italy, Israel, Croatia		
	National Interest Test Statement The aim of this project is to reconstruct the diet, health and lifestyle of prehistoric humans that lived during one of the most extraordinary phases in our evolutionary history, the Neolithic Revolution. This was a period marked by major cultural innovations which witnessed a dramatic increase in population size. Our innovative approach will help to resolve the longstanding questions about the evolution of human diet, and to investigate how changes in diet and cultural practices caused major demographic shifts in human populations. This project will provide new insights about the relationship between nutrition, health and fertility, which ultimately may have played a pivotal role in the reproductive biology and success of our species. The outcomes of this project may eventually have the capacity to shape national strategies in the nutrition science, dentistry, public health and in the food industry.												
DP240101097 Jones, Prof Cameron	**Reactivity Enhanced Low-Valent Alkaline Earth Metal Compounds** The project aims to develop highly activated low oxidation state alkaline earth metal complexes as cheap and sustainable alternatives to toxic/expensive late transition metal complexes, that currently dominate the transformation of inert small molecule substrates into value-added organic chemicals. The project expects to generate major fundamental and applied advances in chemistry, using innovative synthetic and computational approaches, and a multidisciplinary collaborative team. Expected outcomes include building of academic and, later, industrial research capacity, knowledge, an international network, and a highly trained workforce. Success should see substantial economic, environmental and societal benefits flowing to Australia.	90,000.00	180,000.00	180,000.00	90,000.00	0.00	0.00	540,000.00			France, United States of America		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement The project will develop new classes of highly reactive chemical compounds, using cheap, non-toxic base metals, such as magnesium. These will be exploited for the value-added transformation of simple molecules into more complex fine chemicals (e.g. pharmaceuticals). Although such chemical reactions are critical to the national economy, they are currently problematic, typically requiring very expensive and toxic heavy metals (e.g. platinum) to proceed. By solving this problem, the project will help maintain Australia's leading position in the emerging field of sustainable base metal chemistry. It will also be of significant economic and environmental benefit to chemical industry, leading to substantially reduced costs, and decreased need for toxic metals in fine chemical production. Through its advances, the project will ultimately enable the commercial translation of valuable intellectual property to industries and institutions, both Australian and international, which are focussed on the sustainable production of high value fine chemicals from cheap and abundant feedstocks.												
DP240101212 Zhang, Dr Qi	**Molecular mechanism of the PRC-dependent RNA degradation by the rixosome** Polycomb repressive complexes (PRCs) and the rixosome are evolutionarily conserved enzymes that are required for silencing the developmental genes of multicellular organisms. This project aims to investigate how these key regulators maintain gene repression using cutting-edge approaches ranging from biochemistry, structural biology, cell biology to genomics. The expected outcomes include generating new knowledge in gene regulation, strengthening the research capabilities of Australia in fundamental biology, and training the next generation of scientists.	88,250.50	181,750.50	183,843.00	90,343.00	0.00	0.00	544,187.00					
	National Interest Test Statement All of the cells within a multicellular organism contain the same genetic information – DNA. Timely and dynamic regulation of gene expression allows cells to progress from pluripotent stem cells to terminally differentiated cell types in tissues, which is essential for embryonic development. Polycomb repressive complexes (PRCs) and the rixosome are crucial enzymes for the development of multicellular organisms through the maintenance of gene repression. However, the lack of mechanistic studies hinders our understanding of these fundamental processes. This project aims to investigate how these key regulators maintain gene repression in mammals. This research will increase our understanding of how genes are silenced by a collection of key enzymes and what the consequences are if they are dysregulated. More broadly, abnormal embryo development represents one of the major causes of human infertility. Given the essential role of PRCs and the rixosome in embryo development, the knowledge from this study could be used to detect the risk of embryos failing to develop. In the long term, it could be used for preimplantation genetic diagnosis and screening tests prior to in vitro fertilization (IVF) procedure.												
DP240101293 Anderson, A/Prof Fay A	**Australian Journalism, Trauma and Community** This project aims to investigate the professional and personal costs of reporting on trauma for Australian journalists and the communities they engage with, by undertaking a groundbreaking historical study of journalists' exposure to trauma over the past century. It seeks to generate new knowledge by transforming our understanding of the relationship between journalism and trauma and the wider implications for the profession and the public. Expected outcomes of this project include scholarly, education and public resources which will inform and broaden ongoing debates about Australian journalism. This will provide significant benefits for journalists and the public, creating urgent awareness and better support and training initiatives.	151,861.00	283,506.00	265,347.00	133,702.00	0.00	0.00	834,416.00			United States of America, Canada		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
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	The project aims to support the Australian Government's commitment to health by understanding how Australian journalists, as first responders, have been impacted by the experience of reporting on trauma, and in turn, how survivors of traumatic events view their treatment by the media. The project will contribute to building a healthy and resilient community by developing new approaches to create greater awareness in the profession, educate journalists on the consequences of reporting on trauma, and allow for communities to be better informed when interacting with the media during traumatic events. The project includes a substantial public program collaborating with media, mental health organisations, and the public to communicate our findings. The project will strengthen support for journalists and the community by producing ground-breaking new scholarship combining archival and media analysis with oral interviews and fieldwork, alongside innovative and accessible public and policy outcomes to guide contemporary debates about trauma.												
DP240101458 Kulic, Prof Dana	**Human models for accelerated robot learning and human-robot interaction** This project aims to develop novel approaches to teach robots to proficiently interact with humans in a safe and low-cost manner. To achieve this aim, this project will develop novel models from which various human behaviours can be generated and used to train human-robot interaction policies in simulation. Expected outcomes of this project include new computational models of human behaviour built using cognitive science theories and limited data and new training schemes for robot learning in simulation. By training robots in simulation with accurate human models, this research will enable fast and safe robot training to support the deployment and adoption of robots in human contexts such as healthcare facilities, homes, and workplaces.	87,194.00	175,638.00	180,638.00	92,194.00	0.00	0.00	535,664.00					
	National Interest Test Statement Robotics and AI have the potential to provide innovative solutions for critical societal issues (e.g. ageing populations, climate change, energy transformation) in a wide range of applications including healthcare, agriculture, space, home, and service. In Australia, robotics and AI could add $2.2 trillion to the economy over the next 15 years by raising productivity and creating jobs that are safer and more satisfying. However, robots will only be successful and accepted in these new contexts if they can interact effectively with people. This project will address this issue by developing computational models of human behaviour that can be used to teach robots how to safely interact with others in a low-cost manner. The outcomes of this research have the potential to deliver significant economic and social benefits, particularly by contributing to the design, development, and deployment of robotic systems that can support declining workforces in the health, service, and home care sectors.												
DP240101647 Currie, Prof Peter D	**How do stem cells get specified during embryonic muscle development?** This project aims to investigate the mechanisms by which muscle stem cells first form in the embryo. This project expects to generate new knowledge on the mechanism that patterns cell types in the embryonic myotome. Expected outcomes of this project include uncovering the developmental mechanisms of cell type specification in the myotome with specific reference to the generation of stem cells. This should provide significant benefits as it will inform how long lived tissue resident stem cells can be made in the first instance, knowledge that is critical for making stem cells on demand outside the animal and manipulating stem cells in living tissue.	102,500.00	217,500.00	217,500.00	102,500.00	0.00	0.00	640,000.00					
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	This grant will provide information on how tissue resident stem cells are made in living tissues, knowledge that will have impact in the field of stem cell science generally. This information is critical to the ability to manipulate, grow and make stem cells, inside and out side the body, information that is important in generating stem cell technologies, a science and industry area that Australia leads in globally. It would also be foundational knowledge for the growing cellular agriculture industry, with which CI PC has established links and IP. This industry chiefly uses tissue-derived muscle stem cells as their starting material for culturing in vitro to generate laboratory based meat. Knowing what specific muscle stem cell source provides muscle growth in vivo and the signals that trigger maximal stem cell proliferation will speed up efficient muscle stem cell culture and production in vitro, the single most significant hurdle to the scale up required for the success of this nascent industry. Finally knowledge generated during the tenure of this grant is also is important in understanding how embryos generate specific cell types and tissues, and shed light how animals are built from an embryonic template, the fundamental aim of the field of Developmental Biology.												
DP240101649 Clough, Prof Jonathan A	**Improving Legal Frameworks to Support Online Child Sex Abuse Prosecutions** This project aims to gain a deeper understanding of the nature and extent of online child sexual abuse prosecutions in Australia. Using empirical studies to draw on the practical experience of law enforcement and other stakeholders, it will generate new knowledge concerning the suitability of Australia's legal and policy frameworks to effectively investigate and prosecute such offences, with a particular focus on the Asia-Pacific region and the use of new technologies. Expected outcomes include evidence-based recommendations on criminal law reform and enforcement policy that aim to improve the international enforcement of online child sexual abuse offences, and to provide a model for other forms of serious transnational online crime.	31,765.00	74,414.50	81,941.00	39,291.50	0.00	0.00	227,412.00			Thailand, Philippines		
	National Interest Test Statement There is no greater responsibility for law enforcement than the protection of children from harm. Australia is a world leader in the investigation and prosecution of online child sexual abuse offences. However, laws and policies must be able to keep pace with emerging technological developments and the challenges of international cooperation. This innovative research will contribute to Australia's national interest by ensuring that Australia's legal and policy frameworks effectively support the investigation and prosecution of online child sexual abuse offences. This helps to protect Australian children from harm and protect children overseas from Australian offenders. The focus on cooperating with our Asian and Pacific neighbours is aligned with Australia's regional focus, and the inclusion of the darknet provides insights into the increasing misuse of emerging technologies. The lessons learned from this research may also be adapted to the investigation and prosecution of other forms of serious online crime and are aligned with Australia's role as a global leader in addressing the challenges of cybercrime. Expected outcomes include evidence-based recommendations on criminal law reform and enforcement policy that aim to improve the international enforcement of online child sexual abuse offences, and to provide a model for other forms of serious transnational online crime.												
DP240101786 Müller, A/Prof Bernhard	**On the origin of very massive back holes** This project aims to investigate the origin of massive black holes observed in recent years by gravitational wave detectors. This project expects to generate new knowledge in the area of very massive stars utilising stellar evolution models, hydrodynamic simulations, light curve calculations and supernova observations, in order to explain the unexpected absence of a gap in the black hole mass distribution. Expected outcomes of this project include a better understanding of mass loss and the collapse of very massive stars as key factors for the observed black hole mass distribution.This should provide significant benefits for gravitational wave astronomy, but also for observations of stellar explosions by informing future survey strategies.	60,000.00	125,000.00	100,000.00	35,000.00	0.00	0.00	320,000.00			Japan, Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement Australia is investing hundreds of millions of dollars in facilities such as the SKA and the ARC CoE for gravitational wave astronomy. This proposal aims to provide theoretical modelling for some the the key science questions they pursue, such as the nature of the first stars in the universe and the origin of very massive black holes. It allows to leverage these investments by providing the underling theory to allow understanding the data they take, which is an essential step in optimal use of these Australian investments. The proposal intends to also involve graduate and undergraduate students and train them in techniques of computer-based modelling and data analysis, based on broad questions as found in astronomy and obtain skills well sought-after in the Science, Engineering, Mathematics and Technology (STEM) field as well as in industry. Most of our graduates find move to expert positions with Australian technology companies or government positions such as the Bureau of Meteorology (BOM) or in the defence and national security sectors.												
DP240101989 Black, A/Prof Nicole B	**Economic analysis of child maltreatment and child protection** This project aims to investigate the economic causes and consequences of child maltreatment. It expects to generate new knowledge by applying microeconometric methods to large Australian administrative databases that track children's health, education and welfare receipt over time. The expected outcomes of this project include an expanded knowledge base on how economic shocks affect maltreatment, the economic consequences of placing children in out-of-home care, and the value of economic policies for reducing the intergenerational transmission of maltreatment. This should provide significant benefits, such as providing practical evidence to policy makers and service providers that help prevent child maltreatment and reduce its harms.	89,320.00	146,151.00	112,170.00	55,339.00	0.00	0.00	402,980.00					
	National Interest Test Statement Children who are victims of maltreatment – such as physical, sexual and emotional abuse – experience considerably worse life outcomes in numerous domains, with large associated costs on individuals and society. There is an urgent need for high-quality evidence from multiple perspectives to support the prevention of child maltreatment and its harms. Child maltreatment is highly correlated with economic disadvantage, yet there is a shortage of causal evidence. This project will investigate the economic causes and consequences of child maltreatment and out-of-home care placements in Australia. The project will produce new evidence on the extent to which economic downturns affect rates of child maltreatment, how child maltreatment and out-of-home care placements are associated with the economic potential of young Australians, and how economic policies may prevent the transmission of child maltreatment to subsequent generations. This novel evidence will benefit Australia by supporting the development of policies to help prevent child maltreatment, improve the targeting of effective services to parents and children, and ultimately, improve economic and health outcomes for our most vulnerable children.												
DP240102006 Schiffrin, A/Prof Agustin E	**Controllable quantum phases in two-dimensional metal-organic nanomaterials** This project aims to design novel two-dimensional metal-organic nanomaterials and to control electronic quantum phases therein. The project expects to generate new fundamental knowledge in advanced materials, solid-state physics and quantum nanoscience. It will rely on supramolecular chemistry to synthesise new atomically precise functional materials. Expected outcomes include the fabrication of new advanced nanomaterials, as well as the observation and control of new quantum phenomena therein. The project should provide significant benefits, such as advancing basic research in quantum nanomaterials, and aiding to lay the foundation for next-	78,335.50	159,020.50	163,713.00	83,028.00	0.00	0.00	484,097.00				Czech Republic, Netherlands	

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	generation electronics and information technologies. **National Interest Test Statement** Modern digital information technologies rely on the efficient control of electrical signals in electronic devices. Conventional methods for improving the advanced materials and fabrication processes involved in such technologies are fast approaching their inherent limits. As a result, next-generation information technologies will require novel functional materials and device functioning mechanisms. This project aims to contribute to this need by designing new functional nanomaterials based on organic molecules, benefitting from their versatility, flexibility and efficiency as building blocks. It will pave the way for new devices and device functioning mechanisms based on the quantum physics of such materials. This project falls within the Government's National Science and Research Priority of "advanced manufacturing", and within the new National Quantum Strategy. It will stimulate innovation in advanced materials, solid-state physics, nanoelectronics and quantum science. It will leverage and ensure a leading role of Australia's resources and cutting-edge expertise in these fields of the highest global research priority. It will exploit platforms already in place at the investigators' institutions for knowledge transfer, from fundamental research outcomes to the potential development of intellectual property, applications and commercialization.												
DP240102156 Currie, Prof Peter D	**The developmental and evolutionary origins of vertebrate fins and limbs.** This project aims to investigate the origin of paired appendages, a major event in early vertebrate history that changed ecological opportunity and fuelled the radiation of jawed vertebrates. This project expects to generate new knowledge on the mechanism that drove this innovation, which despite over a century of debate, remains one of the great unknowns of comparative vertebrate evolution. Expected outcomes of this project include uncovering the anatomical changes underpinning the origin of the vertebrate appendicular system. This should provide significant benefits as it will inform our own natural history and provide a paradigm for studying gene network conservation, phylogenetic modifications, and the acquisition of novel structures.	113,718.50	203,944.00	182,499.50	92,274.00	0.00	0.00	592,436.00			United States of America, England, Canada		
	National Interest Test Statement This project uses unique Australian aquatic animals to address the fundamental question of how the vertebrate body plan formed. Our research highlights the richness and diversity of Australian species and the importance their place in the tree of life holds to answering questions that could not otherwise be addressed. Our use of unique Australian living and extinct fossils will shed light on how evolutionary changes in the way embryos develop can result in the diversity we see in nature. Furthermore, inventing techniques for working with "primitive" species such as sharks will allow study of the embryology of a previously inaccessible group of animals. This will benefit the national and international community of evolutionary biologists, and facilitate future work to gain insight into those aspects of vertebrate development that are deeply conserved. Elephant fish are important Australian fauna, being the most "primitive" living jawed vertebrate. This funding will provide the world's only access to their embryos. In addition, this proposal makes use of another uniquely Australian natural resource, the fossils of the GoGo fauna, in which soft tissues are preserved from the Devonian age. Beyond academic publication and meetings our results will be communicated through ARMI's strong social media presence. Furthermore Gogo fossil discoveries have been consistently featured in popular media and international documentaries, an approach we will continue to embrace.												
DP240102205 Ayton, Dr Darshini R	**Consumer and Community Involvement Process Implementation Model** The project aims to examine the barriers and enablers to Consumer and Community Involvement. We will generate new knowledge via innovative methods from narrative medicine and economic and marketing studies including establishing the first Community of Practice for consumers and stakeholders in dementia research as the example. The outcomes include the creation of a process implementation model for Consumer and Community	98,412.50	199,971.00	206,089.50	104,531.00	0.00	0.00	609,004.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	Involvement to inform policies and guidelines for research systems and funding. This process model will propel research forward and generate opportunities to maximise the health and social benefits of research, including significant translation of research into practice. **National Interest Test Statement** Internationally, people affected by a condition and unpaid caregivers (i.e. Consumers), and the general public and stakeholders (i.e. Community) are involved in the design and conduct of research. However, the 'how to' of Consumer and Community Involvement in research where consumers may have physical or cognitive impairments has not been examined in the Australian context, and there is limited guidance for researchers on how to do this well. Using dementia research as an example, this project aims to address the significant knowledge gaps in Australia on how to involve consumers and the community in ageing research in a meaningful way across research disciplines and research phases. With further government funding projected for health and aged care, the Community of Practice and how to guide this project will create will serve as an exemplar of best practice Consumer and Community Involvement to inform policy and facilitate improved research relevance, outcomes, and translation into practice that will cross disciplines and health conditions.												
DP240102206 McDowell, A/Prof Tara C	**Care and Repair: Rethinking Contemporary Curation for Conditions of Crisis** This project aims to address the significant challenge of how to curate contemporary art under conditions of crisis, made acute by the pandemic. It expects to generate new knowledge in the growth areas of contemporary art and curatorial practice, which will be translatable to creative industries seeking solutions to similar challenges. Anticipated outcomes include new models for sustainable, future-oriented creative practice; a stronger international profile for Australian artists and curators; and the establishment of a regional network of artists and curators between Australia and Southeast Asia. This should significantly aid our understanding of how to meet current and future challenges to producers and audiences of contemporary art. **National Interest Test Statement** The creative industries are beset by multiple crises, from climate change to the legacy of colonialism. The pandemic alone resulted in more than 10 million jobs lost in creative industries worldwide and countless cancelled cultural events. This project aims to respond to the significant challenge of how to curate contemporary art in these conditions of crisis. By identifying new models and tools for cultural practice, the project is expected to increase understanding about the profound challenges facing the cultural sector while contributing to Australia's capacity to meet such challenges. Contemporary art is a popular and successful cultural form in Australia, and the public leadership role of the curator has never been more crucial. The project will benefit Australia by developing translatable frameworks for Australian curators and the broader creative industries. The project's learnings are also expected to increase resilience in the Australian cultural sector in times of crisis. Lastly, the project benefits Australia by strengthening regional collaborations and networks between Australia and Southeast Asia, including through an important new partnership being established between curatorial and cultural entrepreneurship research programmes in Melbourne and Singapore.	29,068.00	97,862.50	104,991.50	36,197.00	0.00	0.00	268,119.00			Singapore		
DP240102221 Gresil, Dr Matthieu	**Developing vitrimers: next generation reusable plastics** This project aims to develop a new class of advanced multifunctional polymer materials with the potential to underpin significant breakthrough capabilities for soft materials in general. The proposed work will relocate biological catalysts from their native, wet environment to solid organic engineering bio-sourced resins. Suitably selected enzymes will allow creation of polymer-based	88,335.50	184,020.50	188,013.00	92,328.00	0.00	0.00	552,697.00			France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	products that can be fully recyclable, with built-in properties such as self-healing, shape morphing, which are mechanically tunable, and have the ability to be reprocessed/recycled multiple times. This research will initiate a disruptive change in the application of biocatalysts for bio-based polymers.												
	National Interest Test Statement												
	Australia is facing a critical challenge with the increasing amount of plastic waste in the environment. Plastic waste has severe impacts on the environment, marine life, and human health, and poses significant economic costs to communities. Therefore, finding an effective solution to reduce plastic waste is essential to protect our environment and ensure the long-term sustainability of our economy. Our research project aims to develop a novel bio-based vitrimer material that has the potential to replace traditional plastics and contribute to a circular economy. This innovative material is created from renewable sources, such as plant-based polymers, and has superior properties to traditional plastics, including higher mechanical strength, toughness, and recyclability. The project has significant economic and environmental benefits for Australia. The adoption of the bio-based vitrimer material can create new opportunities for the domestic manufacturing industry, generate employment, and promote a sustainable and circular economy. This new material has a high potential for commercialization and can attract investment and collaborations from both local and international companies. The project also addresses Australia's commitment to reducing plastic waste and improving environmental sustainability. The bio-based vitrimer material has excellent properties for recyclability, and it can contribute to reducing plastic waste in the environment.												
DP240102250 King, Dr Stewart B	**World Crime Fiction: Making Sense of a Global Genre** This project aims to generate new knowledge about the worldwide popularity of crime fiction by analysing the genre's engagement with the major global challenges of our time, from climate change to the crisis of democracy. Using data from scholars and fans across all continents, and employing an innovative comparative methodology, it seeks to produce a new framework for analysing the global practice of crime fiction. Outcomes include a deeper understanding of the capacities of crime fiction to explore the complex relationship between crime, law and justice in various settings. The project will benefit Australia by creating new insights into the unique contribution of Australian, including Indigenous, crime writers to this truly global genre.	35,377.50	93,278.00	97,509.00	39,608.50	0.00	0.00	265,773.00			United States of America, England, Ireland, South Africa, India, Macau (SAR of China), Argentina, Japan, Sweden, Indonesia, Poland, France, Mexico		
	National Interest Test Statement												
	In Australia, as in the rest of the world, crime fiction is one of the most popular and widely disseminated literary forms, yet the scholarship remains committed to British and American understandings of the genre. This bias means that the innovative contributions of Australian (including Indigenous) and other crime writers to the genre are often misrepresented as derivative and marginalised. The project aims to challenge this practice by offering a new way of understanding world crime fiction from the point of view of its engagement with five major global themes: the crisis of democracy; the climate emergency; gender and sexual identities; social and economic inequality; and colonial legacies. In doing so, the project will demonstrate how global crime fiction serves as a powerful medium for analysing crucial political and social issues with direct impact on Australian society. As a barometer of prevailing attitudes, crime fiction's localised explorations of crime, law, justice, policing, governance and ethics can provide important new perspectives on how the major global challenges of our time are perceived and addressed in Australia and around the world. The creation of online exhibition spaces, presenting how crime fiction engages with these issues, will be an important resource for scholars, educators, publishers and community reading groups.												
DP240102301 Long, Prof Paul L	**Mapping Australian Homemade, Amateur & Do-it-Yourself Cultural Economies.** This project aims to fill a significant gap in the Australian Government's National Cultural Policy to 'Revive' the cultural sector. The project expects to reveal the ignored sector of non-professional, homemade, amateur and do-it-	65,563.00	183,952.00	215,209.50	96,820.50	0.00	0.00	561,545.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	yourself creativity. Intended outcomes include the first detailed study of the contribution of the 45% of Australians who creatively participate in the arts as producers of forms including poetry, music and fine art and their relationship with the professional cultural and creative industries. Participatory mapping methods that expand new knowledge should provide public benefits in broader recognition and understanding of the value of everyday Australian creativity, seeking to impact democratic policymaking.												
	National Interest Test Statement This project speaks to a gap in the newly launched Australian Government's National Cultural Policy and its ambition of expanding economic opportunities and providing avenues to deepen and showcase national identity and to ensure 'A Place for Every Story'. This project reveals the ignored space and agency of the homemade, amateur and do-it-yourself that sits between the publicly-funded and commercial spheres of cultural and creative industries. It is the first detailed qualitative study of the activities, expressions, associations, and contribution to the economy and culture of the 45% of Australians who creatively participate in the arts as producers of forms as diverse as poetry, music, fine art and the interactions between them. Expected project outcomes are a new understanding of: (a) non-professional creatives and the contexts in which their activities take place; (b) the role of non-professional creativity in the wider cultural economy; (c) the function of everyday creativity in building contemporary community. The project aims to direct these outcomes in expanding and democratising policy priorities. Engaging policymakers, professionals and publics, the project aims to deliver benefits for the sustainability of Australia's cultural identity, communities and economy. The outcomes will be achieved through scholarly research, creative collaboration, the production of policy papers and a legacy underwritten by a sustainable cultural mapping of non-professional creativity.												
DP240102350 Purcell, Prof Jessica S	**Geodesic arcs and surfaces for hyperbolic knots and 3-manifolds** This project aims to use recent breakthroughs in mathematics to determine explicit geometric information on mathematical spaces, namely knot complements and 3-manifolds. These spaces arise in applications across science and engineering. They break into pieces that admit geometry, where hyperbolic geometry is the most common. This project expects to generate new knowledge around a number of open questions and conjectures on the hyperbolic geometry of knots and 3-manifolds. Expected outcomes include development of theory, and improved geometric tools. It will benefit the mathematical community through new insights and improved methods, and possibly lead to downstream applications in other scientific fields that rely on geometry.	88,028.00	176,056.00	141,759.50	53,731.50	0.00	0.00	459,575.00			United States of America, England, Israel, Germany		
	National Interest Test Statement A string with its ends welded together is a model of a mathematical knot. If the string is tied before its ends are welded, often there is no way to remove the crossings in the string without cutting the string. This is called nontrivial knotting. However, sometimes a string with complicated crossings can be unknotted, or moved so that all its crossings disappear without cutting. Given a ball of string, it is a challenging problem to determine whether the ball is nontrivially knotted or unknotted. Knot theory is the area of mathematics that studies such knots. It is an area of geometry whose mathematical study began in the 1800s, and continues today with applications to DNA knotting, protein folding, and quantum entanglement. Determining when two abstract knots are the same remains a very challenging problem. This project will use tools from geometry to address questions in knot theory, and to find properties of knots that help distinguish them. If successful, it will lead to better understanding of knots and of closely related spaces, and generate valuable new knowledge to stimulate further research in geometry. This, in turn, may have downstream applications in other scientific fields that use geometric techniques, in particular those that encounter knots.												
DP240102369	**Where Gesture Meets Grammar: Crosslinguistic Multimodal Communication**	74,766.50	143,525.00	142,993.50	74,235.00	0.00	0.00	435,520.00			England, Norway		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Margetts, Dr Anna	This project aims to investigate both differences and universal tendencies in the interplay of speech and gesture across four languages of importance for Australia. The crucial role of gestures is often overlooked in the analysis of communication. In this project, specialists from linguistics, gesture and cultural studies, psychology and cognitive science collaborate using an innovative approach to generate new knowledge about how speech and gesture interact to communicate meaning. The project can provide significant benefits for our understanding of language and cognition, cross-cultural communication in multilingual Australia, and the documentation of endangered languages.												
	National Interest Test Statement												
	Communication involves spoken language in combination with gestures and body language. Despite their crucial link to language and thought, the importance of gestures has been overlooked in research on communication. Improvements in analytical and recording techniques mean that we are now able to fully investigate these connections. This project investigates the multimodal nature of communication by analysing data from four languages of importance in the Australian context: (a) Australian English, (b) Korean – spoken by one of Australia's most important trade partners, (c) an Australian Aboriginal language, and (d) a language of Papua New Guinea – Australia's neighbour and major recipient of aid. The research explores differences in what aspects of meaning are contributed by words vs. gestures in different languages. It will enhance understanding of how communication works, particularly within interactions in multilingual Australian society and in relations with our neighbours. The project will enrich existing archived data for endangered languages, unlocking important cultural recordings for new purposes. The project includes capacity building for community-based research, training of early career researchers, and public outreach. The outcomes are designed to promote better cross-cultural understanding of communication in multilingual Australia. In this way, this crosslinguistic project will strengthen Australia's international leadership position in multimodal communication.												
DP240102417	**Fluid chemistry and critical mineral enrichment in salty metamorphic belts**	47,889.00	92,625.50	82,131.50	37,395.00	0.00	0.00	260,041.00					
Tomkins, Prof Andrew G	Several geological regions in Australia are worth billions of dollars to our economy in their contained copper-goldcobalt and uranium-rare earth element mineral deposits. These regions will continue to be important to Australia as the world transitions to a renewable energy economy because they can provide some of the most critical metals needed for that transition: Cu, Co, rare earth elements. This project aims to provide a fundamental quatitative understanding of the geological processes that form these deposits. We will conduct experiments to generate quantitative models of the metamorphic and structural processes that control the liberation and migration of highly saline fluids, which are ideal for transporting a large range of metals.												
	National Interest Test Statement												
	1. We aim to improve our fundamental understanding of the geological processes that formed critical element-rich mineral deposits. 2. Currently, we know that very salty fluids were generated during metamorphism in several economically important mineral belts in Australia. These fluids are ideal for transporting metals and were likely responsible for forming numerous critical element-rich mineral occurrences. But we currently have no quantitative constraints on the processes that control fluids and metal liberation and transport; this project aims to generate experimental data that allow quantitative modelling of the mineral deposit forming processes. 3. Mineral deposits in the regions of interest are worth billions of dollars to Australia's economy, and many new deposits need to be found for the renewable energy transition. By providing a foundation for mining companies to improve their mineral exploration approaches, this project will help to boost and consolidate Australia's economy in the longer term. 4. The Lead CI has established relationships with the minerals industry, ensuring translation of the research to that sector.												
	Advancing Policy Design for Robots in Public Spaces												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240102432 Mintrom, Prof Michael A	Advances in robotics are set to transform service delivery, health care, and other social services. How will this affect our shared public spaces? Well-informed policy design will be critical. Experience with automobiles shows new technologies can profoundly reshape public spaces for all citizens; for good or ill. This project explores how policy design can ensure robots operate safely in public space and protect public interests. It will develop a feasible, flexible, and replicable method for incorporating citizen experience and insights into policy design to manage the growing presence of robots in Australian public spaces. The resulting method is intended to support successful technology adoption and inform human-centred robotics design.	93,590.50	193,887.50	210,602.00	110,305.00	0.00	0.00	608,385.00			Netherlands		
	National Interest Test Statement Robots are increasingly appearing in public spaces in Australia, including on streets, in parks, in hospitals and in supermarkets. The benefits of robots to human wellbeing could be immense. But experiences with automobiles remind us that the introduction of new technologies can have profound impacts on public spaces, for good or ill. The presence of robots in public spaces will affect all citizens – not just their immediate users. A significant knowledge gap exists concerning the broader social impacts of the growing presence of robots in public spaces. This project will examine how people perceive and interact with robots in different public spaces. It will involve design workshops where researchers, citizens, and policy designers will together explore new means of guiding how robots impact on public spaces. Our research will generate new knowledge to inform policy design. That knowledge could assist Australian governments and regulators to better anticipate the effects of wider use of robots and plan policies to encourage good outcomes for all. The safe and effective operation of robots in public spaces could provide significant social and economic benefits by allowing more Australians to safely take advantage of major technological advances. The project could also provide important insights for Australia's robot industry. Findings will be disseminated beyond academic via the co-design workshops central to the project, and via seminars, short papers, videos, and blogs.												
DP240102498 Nie, Prof Jian-Feng	**Stronger, coarser-grained biodegradable zinc alloys** This project aims to develop stronger and more durable zinc alloys for a new generation of biodegradable metals for potential load-bearing orthopaedic applications. It expects to deliver a group of novel zinc alloys with better properties and a new technology for manufacturing them, and to use advanced experimental techniques to reveal deformation and strengthening mechanisms that underlie the unusual Hall-Petch and anomalous twinning phenomena and the unprecedented properties of these alloys. Expected outcomes are likely to form the technology and scientific basis for developing better biodegradable metallic alloys. This has the potential eventually to create a better life for thousands of Australian patients.	97,335.00	199,375.00	173,315.00	71,275.00	0.00	0.00	541,300.00			Germany, Switzerland, United States of America		
	National Interest Test Statement The traditional metal plates for internal fixation of fractured bone are made of non-biodegradable stainless steel or titanium. The presence of these implants inside human body may cause pain and discomfort of patients and often end up with an additional surgery to remove them once the broken bone is fully healed. This project will develop zinc alloys for fabricating biodegradable bone plates - the world-first metal that can be used on load-bearing bones and will dissolve over time in the human body without the side effects of permanent metal implants. The outcome of this research should be a revolutionary step in the design and development of internal fixation devices for broken bones that will avoid the discomfort associated with traditional permanent implants. Australia has over 173,000 broken bones each year. This project has the potential eventually to create a better life for thousands of patients in Australia. This project will also lead to invention of a new class of biodegradable materials and a new manufacturing technology to manufacturing them that will be patented, commercialised and clinically trialled. I will work with experts on biomedical engineers and clinicians to transform the technologies into biomedical products.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240102540 Blewitt, Dr Claire A	**Educator-child interactions and childhood social and emotional learning** This project aims to enhance educator-child interactions to support young children's social and emotional learning in Early Childhood Education and Care. It expects to generate new knowledge about adult-child interactions for improved child outcomes by examining the effectiveness, theories of change and implementation of an online Social-Emotional Engagement and Development Program to promote educators' engagement with three tiers of social and emotional learning strategies. The intended outcome is a confirmed evidence base supporting the program at scale and aligned professional learning resources. This project has potential to mitigate against the financial and social costs associated with mental ill-health in early childhood.	113,104.00	199,212.50	149,443.50	63,335.00	0.00	0.00	525,095.00					
	National Interest Test Statement Epidemiological studies highlight an increasing prevalence of emotional and behavioural challenges in young Australian children requiring targeted support. Robust evidence shows that the quality of educator-child interactions influences the social and emotional learning competencies that underpin a child's lifelong health and wellbeing. Strengthening the capability of early childhood educators to foster children's social and emotional growth, through their interactions with children, is therefore essential. This project seeks to create new knowledge to support educators to embed strategies that foster children's social and emotional learning (SEL) into their everyday interactions. The project will create new knowledge regarding: 1) tailored and responsive SEL supports that can be delivered at scale within the early childhood sector; 2) the pathways by which these supports influence domains of educator practice; and 3) the influence on children's subsequent social and emotional health. The study's use of co-design approaches involving leading early childhood education providers, and inclusion of a public education campaign, will support adoption of the research across the early learning community, to strengthen the capacity of the early childhood education and care sector to reverse the national burden associated with poor developmental outcomes in the early years.												
DP240102637 Hodgins, Dr Kathryn A	**Some like it hot: the genetics of rapid adaptation to climate change** This project investigates the genetics of rapid evolutionary adaptation by utilising genomes sampled over unparalleled temporal and spatial scales in a highly invasive and agriculturally significant weed. This project expects to generate new knowledge about the genetic mechanisms that facilitate adaptation to climate change by developing new theory and genomic predictions, and then testing them under realistic field conditions. Expected outcomes include a deeper understanding of the genetic basis of adaptation, and a powerful framework to predict the evolutionary consequences of climate change. This should provide significant benefits, including improved capacity to anticipate the effects of climate change on noxious and threatened species.	83,317.00	151,118.50	174,280.00	106,478.50	0.00	0.00	515,194.00			South Africa, Canada		
	National Interest Test Statement Species invasions and climate change are among the most pressing environmental issues in Australia and globally. Understanding the evolutionary processes promoting the establishment and expansion of initially small populations in novel environments is vital for designing effective strategies to hinder the spread of invaders and to combat declines in native species. This project will address important yet unresolved questions in evolution and invasion biology using a combination of mathematical modelling, field experiments, and genomics of capeweed: a globally invasive plant that is prevalent in Australia and a powerful system for identifying drivers of invasion and population persistence when confronted with climate change. This project will deliver critical knowledge about the prevalence and genetic basis of rapid adaptation to climate, and advance Australia's research capacity in evolution and invasion biology. Insights from												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	this project are also applicable to conservation of endangered species, in which principles of population growth and persistence are equally relevant. Our genomic resources, novel theory and findings will be widely disseminated through public repositories, journals, workshops and conferences to maximise impact and facilitate translational outcomes for this highly invasive weed.												
DP240102680 Windt, Dr Jennifer M	**The Dreamscape Project: Phenomenology and neurophysiology of dreams** The Dreamscape Project aims to discover the neural basis of dreaming. Building on the world's largest database of sleep electroencephalograms (EEG) and associated dream reports, the project applies cutting-edge analyses of neural activity to resolve why each night, healthy adults alternate between unconscious sleep and vivid dreams. The results promise to shed light on the mystery of dreaming and help locate consciousness in the physical world. Expected outcomes include best-practice guidelines for dream research and a model of open data-sharing for consciousness science. Anticipated benefits include deeper understanding of how and why everyone dreams, the role of dreams in waking life, and their impact on sleep quality and well-being.	91,711.00	191,980.50	206,236.50	105,967.00	0.00	0.00	595,895.00			France, England, Finland, United States of America, Switzerland, Netherlands, Italy, Germany, Brazil, Canada		
	National Interest Test Statement Dreaming contributes to memory consolidation, learning, creativity, and our emotional well-being. Despite spending a third of our lives asleep and a large part of sleep dreaming, we have a poor understanding of the neural basis of dreaming. Popular sleep trackers and apps promise insights, but dreaming cannot be understood without identifying the underlying processes. In seeking to better establish how and why we dream, the project will use computational tools and the world's largest database of sleep recordings and dream reports (which we have built and is set to be expanded in this project). By identifying the processes underpinning dreams, the project seeks to benefit members of the public and scientists who are focused on improving emotional well-being, memory, and learning. The project also aims to provide new standards and resources by making dream data freely accessible to researchers and citizens, and it will share the results with the public and scientists through a series of popular media communications.												
DP240102765 Bui, A/Prof Ha	**Mud pumping under rail tracks: from Micromechanics to Predictions** Mud pumping under rail tracks is identified as the most frequent issue causing the degradation of rail tracks and increasing their ongoing maintenance cost across Australia and worldwide. This project aims to further the understanding of mud pumping mechanisms across different scales. A novel combined experiment-computational approach will be developed to observe, analyse and link different material properties and external conditions governing the mud pumping process. It will lead to better criteria for mud pumping and numerical tools for field scale failure analysis and risk assessments. The expected outcomes include the enhanced capability to assess the integrity and stability of rail tracks and better design criteria against mud pumping.	97,995.50	214,351.00	147,995.50	31,640.00	0.00	0.00	491,982.00			France, United States of America		
	National Interest Test Statement The construction and maintenance of Australian railways rose to a record of $12.9 billion in 2021-2023 and is forecast to increase to $129 billion over the coming decade. Rail maintenance activity is expected to increase each year over												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	the forecast period due to the need to maintain a growing rail network and increasing frequency of events influenced by climate change (e.g., heavy rainfalls, floods, coastal erosion). Mud pumping under rail tracks is a phenomenon in which fluidised fines from the soft subgrade migrate to the overlying coarse granular (i.e., ballast) supporting rail tracks. Its presence reduces the operational efficiency and significantly increases ongoing maintenance of rail tracks, particularly heavy-haul tracks. It is one of the most common and significant issues causing the degradation of rail tracks in Australia and worldwide. However, the mechanisms of mud pumping are still under debate, and predicting and quantifying it reliably remains a challenge. This project will shed insights into mud pumping mechanisms and adverse effects on the performance of rail tracks. It will transform the obtained findings into computational tools and models capable of predicting the whole process of mud pumping and their consequences on the performance of rail tracks. The expected outcomes of this project are to help reduce maintenance costs for railway companies and contribute to making rail travel safer for the wider community.												
DP240102830 Sgro, Prof Carla M	**Fitness and evolutionary consequences of developmental plasticity** This project aims to develop a framework for accurately predicting species responses to global change. Phenotypic plasticity will act as a rapid-response mechanism, enabling organisms to survive climatic shifts in the first instance. Understanding how and when plasticity underpins species' persistence under climate change is lacking. This project aims to integrate developmental responses to environmental change with evolutionary adaptation and population persistence in a spatially explicit context. The intended outcome is a powerful and general tool for predicting the impact of environmental change on the distribution and abundance of organisms. Benefits include improved conservation outcomes and better control of pest/disease vectors.	69,657.50	145,267.50	155,694.00	80,084.00	0.00	0.00	450,703.00			United States of America, Denmark, Switzerland		
	National Interest Test Statement The proposed research aims to fill a critical knowledge gap in our understanding of the consequences of developmental responses to environmental change, particularly climate change, on species' persistence and adaptation. This understanding is essential for informing policy decisions related to biodiversity conservation, disease and pest management, and food security, which are key areas of concern for Australia's future. By providing quality training to young Australians, this research has the potential to equip a new generation of scientists with the skills and knowledge necessary to address the critical challenges posed by environmental change. Through this research, young scientists can contribute to developing innovative solutions and making informed decisions that will help secure Australia's future. The outcomes of this research will be broadly disseminated through existing collaborations with government agencies and not-for-profit organisations, maximising the translation of the science into policy outcomes. Overall, this research is a crucial step towards building resilience in the face of climate change and ensuring the sustainability of Australia's biodiversity, food production, and public health.												
DP240103015 Soria, Prof Julio	**Impact of roughness on adverse pressure gradient turbulent boundary layers** This project aims to develop a novel technique for measuring time-resolved fluid velocity vector fields in high-speed flows to investigate rough wall turbulence in adverse pressure gradient environments in unprecedented detail. By using this innovative instrument to study these widespread but poorly understood turbulent flows in power generation and transport, the project seeks to generate new knowledge. Expected outcomes include the development of a new instrument and fundamental knowledge leading to improved designs with higher efficiencies in power generation and transport, resulting in significant benefits such as increased energy security, reduced greenhouse	94,507.00	189,582.50	192,737.00	97,661.50	0.00	0.00	574,488.00			Spain, England, Sweden, France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	gas emissions, and improved quality of life for individuals and society.												
	National Interest Test Statement												
	The transport of goods and resources via marine vessels and aircraft, and low-carbon energy generation, are critical to Australia's economy. However, high fuel consumption resulting from drag and loss of lift in power generation and propulsion equipment incurs significant environmental and economic costs, which are passed onto every manufactured and imported/exported item. To address this, we need new designs for low-friction, high-lift marine, and aerodynamic surfaces in power generation and transport that can operate in adverse pressure gradient environments. However, there's a lack of high-quality measurements, leading to flawed engineering designs. Our project aims to provide this knowledge to develop low-friction, high-lift surfaces that reduce operational energy consumption, low-emission power generation and conversion and low environmental impact. This benefits Australian businesses and individuals who rely on transportation and renewable energy. We aim to reduce carbon emissions, and reliance on non-renewable sources, and contribute to Australia's sustainable future. This project is in the national interest and will have broad benefits for the environment, businesses, and individuals relying on marine and air transportation and energy generation.												
DP240103043	**Role of the superior colliculus in sensory processing**	94,044.00	195,088.00	202,088.00	101,044.00	0.00	0.00	592,264.00					
Stuart, Prof Greg J	The ability of an organism to attend to, and orient towards, stimuli in the environment is critical for survival. In the mammalian brain, the principal brain region performing this function is the superior colliculus. Despite its importance, little is known about the role the superior colliculus plays in sensory perception. This project addresses this issue by leveraging revolutionary new recording techniques to determine how the superior colliculus codes sensory information and ultimately drives behaviour. The outcomes will be of immediate benefit to scientists studying sensory processing and perceptual decision making, and will help keep Australia at the forefront of brain-inspired engineering and the neuroscience-based knowledge economy.												
	National Interest Test Statement												
	Advances in fundamental neuroscience are poised to bring major benefits in the areas of health, innovation and quality of life. This has been recently recognised by governments around the globe with billion dollar investments in neuroscience in the US, Europe and Asia. The research program outlined here will leverage these international initiatives to advance our understanding of how the superior colliculus, a brain region traditionally thought to be involved in attention, contributes to sensory perception and behaviour. Publication of the research findings will contribute significantly to Australia's international standing in sensory, cellular and behavioural neuroscience. Furthermore, the innovative approaches to be employed will offer a new perspective on the neural mechanisms underlying sensory processing and decision-making in the brain. This research will increase our understanding of the mechanisms our brains use to create a reliable and efficient representation of the world around us. It will be of immediate benefit to Australian and international scientists studying how the brain processes sensory information. Furthermore, the results will help to keep Australia at the forefront of brain-inspired engineering and the new neuroscience-based knowledge economy. For example, the findings will aid the development of brain-based artificial intelligence and/or devices for the detection and processing of sensory information.												
DP240103089	**Charge-Controlled Materials for Separations of Important Resources**	62,305.00	128,935.00	134,670.00	92,890.00	24,850.00	0.00	443,650.00					
Batten, Prof Stuart R	This project aims to develop new porous materials that are capable of greater molecular discrimination than current technologies. This project expects to advance understanding of fundamental structure-activity relationships in these materials, and synthetic targets will be geared towards materials for industrially or environmentally important chemical separations associated with metal extraction. Expected outcomes of this project include new insights on the underlying chemistry for												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	tailoring crystalline microporous materials towards select applications. This should provide significant benefits, such as future low-energy and efficient technologies for industrially important separation processes with reduced financial and environmental costs.												
	National Interest Test Statement												
	New classes of porous materials are needed to provide efficient separations for industrially and commercially important chemicals. This project will develop new classes of sieving materials which can be tailored in terms of their internal chemical environment, particularly their charge, to provide better separations for those that are currently costly or inefficient. Charge control is important as some of the most difficult separations are those involving metal ions, or compounds containing these species, such as in mining extractions or e-waste processing. The research has the potential to be transformative in the way that precious metals are extracted, adding to the Australian economy. E-waste is currently exported for processing in harsh, environmentally damaging treatments; clean and economical recovery would add to Australia's economy. The project addresses the early to middle stages of materials development, and does not seek to industrialise or commercialise within the project's lifetime. This proposal will, however, further the work to the point at which industry input can be sought.												
DP240103141 Halls, A/Prof Michelle L	**How lipid binding proteins shape the activity of nuclear hormone receptors** This project aims to explore how a family of lipid binding proteins control organ specific activation of nuclear receptors – receptors that play a key role in generating energy and are critical for life. The project will employ chemical, molecular, cell biology approaches to generate new knowledge about lipid binding protein-receptor interactions and how these complexes dictate receptor activation. The outcomes could provide a roadmap to design drugs that interact with the right protein in the right tissue and in doing so dramatically enhance drug specificity. This will benefit the success of drug treatments which require stimulation of a therapeutic response at a target site, and avoidance of potentially toxic activity at other locations.	120,000.00	240,000.00	240,000.00	120,000.00	0.00	0.00	720,000.00					
	National Interest Test Statement												
	The process of metabolism is essential for life. This process is important in agriculture, biomedical science, biotech, and veterinary science. There are a range of metabolic processes each converting chemical energy into biologically useful energy. A group of receptors called “nuclear hormone receptors” play a vital role in telling the cell what type of metabolic processes to undertake. Natural lipids and hormones activate nuclear hormone receptors in a way that varies between different organs in the body. These variations are not well understood and as a result, many medicines targeting nuclear hormone receptors are general in their application. This results in unwanted side effects that limit their use. The current project seeks to understand the processes that give rise to the variation in different organs. The findings from this project will provide a roadmap for designing future medicines that have fewer side effects. These improved medicines could have broad applications, ranging from biomedical and veterinary science (e.g. to treat auto-immune diseases, thyroid disorders or cancer) to agriculture (e.g. improved pesticides and herbicides). Translation of our findings will be pursued through productive academic-industry collaborations. Findings from this research will therefore support future productive academic-industry partnerships that benefit Australia’s biotech and pharmaceutical sectors.												
DP240103174 Heger, Prof Alexander	**Binary stars and Planets** Aims: This project aims to study stellar and planetary systems in which the objects' spins are tilted with respect to their orbits, e.g., responsible for the seasons on earth. Significance: Observations show that many exoplanets and binary star systems are usually tilted, affecting their evolution. Expected outcomes include understanding the	61,319.50	125,527.50	130,760.50	66,552.50	0.00	0.00	384,160.00			Germany, Belgium, England, Canada, United States of America, Netherlands		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
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	final spin states of white dwarfs, neutron stars, and black holes, and misaligned hot Jupiter systems. Benefits: This project should bring together expertise in stellar modelling, the theory of tidal interactions, and binary dynamics to make first inroads on this problem by allowing for both differential rotation and varying spin direction inside the star, advancing our knowledge on stars and planets.												
	National Interest Test Statement												
	Rotation plays a most critical role in the evolution of stars, how they make the elements necessary to life, about whether they end up as neutron stars or black holes, and is the driving force behind events such as solar flares. This project aims to understand this rotation and how it develops in typical exoplanet systems and in stars that are born in multiples. The project will set a new standard for understanding the crucial role of rotation in the interior of stars, from the birth of the star to its demise, and supersede the current crude assumption of all rotation pointing in the same direction as the orbits. The project will help to leverage Australia's large investment in stellar astronomy by providing theoretical foundation. The project will include training to students in modelling in general, and in orbital dynamics, which is also useful to understand motion of satellites. Training in scientific modelling and critical analysis are well sought-after skills in both Australian industry and business. The majority of our students now leverage their training to pursue productive non-academic careers.												
DP240103208	**(Re)Designing Digital Justice**	93,750.00	190,250.00	206,234.50	109,734.50	0.00	0.00	599,969.00			Malaysia		
Olivier, Prof Patrick L	This project aims to address the challenge of (re)designing novel online court systems by introducing a human-centred design process to the legal process. This project will generate fundamental new knowledge in respect of how to effectively design an inclusive justice system, bridging the gap between the legal system and human-computer interaction. Expected outcomes include how to use technology to implement a more just, efficient, and fair legal system, which is accessible to all Australians. This should provide significant benefits for both Australian society and the legal system.												
	National Interest Test Statement												
	Through innovations in human-centered design and collaborative video systems the project aims to provide fundamental advances in the design and implementation of online tribunal systems that aims to address many of the basic inequities that arise as a result of the geographical characteristics of Australia (i.e. spatial distribution of the population), lack of innovation on the technologies used to realize online tribunals (i.e. adoption of off-the-shelf video conferencing technologies) and particular difficulties that certain marginalized populations (i.e. people with disabilities) have participatory in the legal processes.												
DP240103290	**Imaging the youngest planets**	66,730.50	135,731.00	140,264.00	71,263.50	0.00	0.00	413,989.00			Belgium, France, Chile, United States of America		
Pinte, Dr Christophe	Over 5000 exoplanets have been discovered, demonstrating that planet formation is a robust and widespread process. But we do not know how these planets, including those in our solar system, formed. Our group at Monash pioneered a new technique for detecting "baby" planets --- observed still embedded in the disc of gas and dust from which they are born. The project aims to characterise the youngest detected exoplanets with the world's largest telescopes, including time already awarded on the James Webb Space Telescope. We will image these planets, and model their birth in 3D. The project will develop state of the art computer algorithms for simulating												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	fluid flow and data analysis technics that can be applied to problems here on Earth. **National Interest Test Statement** Australia is a world leader in Astronomy, based on our history of hosting world-class observatories on home soil. Our project leverages Australia's next phase as an Astronomy powerhouse --- as an international partner in the European Southern Observatory which manages the ALMA telescope and the Very Large Telescope in Chile, which our project utilises. The computer simulation techniques we employ are "home grown", having been invented at Monash in the 1970s and developed there ever since, and now widely applied to industrial and engineering problems around the world. This project will keep our place as a world leader in this area. The project will involve new and novel data analysis, imaging and simulation techniques, training two PhD students and four honours students in skills readily transferable to the business world of "big data". Data-fluent graduates are in short supply and high demand. Astronomy is instrumental to public and student interest in physics and mathematics. The project will be supported by public Astronomy talks and school visits.												
	Monash University	4,210,069.50	8,633,357.50	8,313,226.00	3,967,904.00	77,966.00	0.00	25,202,523.00					
RMIT University													
DP240100145 Walia, Prof Sumeet	**Bioinspired photoreceptor and smart neural mimicking technologies** The project aims to address fundamental questions regarding bioinspired artificial photoreceptors and neural-mimicking technologies that precisely mimic light capture abilities of photoreceptors, processing of retinal ganglion cells and functionalities in neurons. This is expected to generate new fundamental and applied knowledge in bioengineered optoelectronic systems. Expected outcomes of the project include new materials with tailored properties at an atomic level for dynamic control of current under different light stimulus wavelengths. This should provide significant benefits such as new advanced materials driven smart architectures that overcome limitations of solid-state systems for next generation of smart technologies. **National Interest Test Statement** The project is proposed amidst strong global recognition (e.g. IEEE International Roadmap for Devices and Systems) that vision-on-a-chip technologies are critical for high-precision Industry4.0 applications across strategic sectors. Conventional imaging and visual recognition systems are large and demand high energy (computing accounts for 5% of global energy consumption). Achieving sustainable hardware implementation of vision presents a complex and multidisciplinary set of challenges. This project draws inspiration from human vision and brain to create a platform that mimics them on a chip. The project will show novel prototypes driven by fundamental advances in materials, optics and machine learning directly addressing national priorities in advanced manufacturing. Given strong demand for implantable visual aids, miniaturised medical imaging equipment, precision manufacturing and autonomous technologies, parallel industry engagement will be undertaken by the CIs (who have a strong record of research translation). This is expected to generate economic, social and employment outcomes giving Australia a first mover advantage in sectors such as smart transport, healthcare and autonomous technologies for space and defence.	70,858.00	145,216.50	154,713.50	80,355.00	0.00	0.00	451,143.00					
DP240100356 Zhou, Dr Xiangmin	**Situation-aware Multi-sided Personalised Analytics in Spatial Crowdsourcing** This project aims to create a next generation recommender system that enables enhanced task allocation and route recommendation on spatial crowdsourcing platforms. It expects to address key challenges in situation-aware reliable recommendation for big spatial crowdsourcing data,	58,950.00	120,065.00	130,057.00	68,942.00	0.00	0.00	378,014.00			Hong Kong (SAR of China), Greece		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	which is vital in improving users' service experience and decision making. Expected outcomes of this project include advanced data models, efficient algorithms and query techniques to create a Crowd-guided Advanced Spatial Crowdsourcing Analytics (CASCA) system that is effective, efficient, crowd-guided, and situation-aware. It will benefit crowdsourced media data analysis and big data fields, bringing economic and social benefits to Australian industries and users.												
	National Interest Test Statement												
	Crowdsourcing, a large group of people contributing or producing goods or services for payment, is becoming more common, but produces big data that need to be better managed to improve the user experience. This project will develop effective, efficient, and scalable techniques to analyse big spatial crowdsourcing data and create a next-generation recommender system for improving the crowdsourcing services. It will address the research gap in how situation-aware reliable crowdsourcing recommendation can help platforms manage services to support users and online organisations in smart decision making. The spatial crowdsourcing analytics framework developed in this project will have many applications, such as improving users' service experience and decision making. Success in this project will advance techniques in crowdsourcing data analysis and big data, make fundamental contributions to computing, and foster an innovation culture in Australia in big data. By enhancing the capabilities of platforms and optimising the service and route recommendation in offline-to-online digital marketing and sharing economy, significant economic and social benefits will be brought to government, society, enterprises, and users. Moreover, the project will facilitate the training of Australian IT professionals in data science. The collaboration with crowdsourcing platform gMission in this project will accelerate the commercialisation of project research outcomes, benefitting local industry.												
DP240100671	**Motion of objects in soils**	77,000.00	159,500.00	167,000.00	84,500.00	0.00	0.00	488,000.00					
Nazem, Prof Majidreza	This project aims to conduct a fundamental study of a challenging class of geotechnical problems in which an object moves inside a layer of soil, interacts with soil, and disturbs it, by developing advanced numerical and analytical methods. This project expects to determine the fundamental principles governing soil behaviour upon movement of embedded objects. The expected outcomes are robust solutions and computational procedures that will benefit government and engineers by providing safer and more cost-effective strategies for designing, constructing, and maintaining Australia's infrastructure. This should bring significant benefits to industries engaged in harvesting energy resources, such as wind farms, as well as oil and gas.												
	National Interest Test Statement												
	Understanding what happens to seabeds or riverbeds when infrastructure such as oil rigs or wind farms is placed there, is critical to predicting the stability of infrastructure and the costs associated with its design, construction, and maintenance. A clear understanding of ground behaviour in such scenarios has eluded us to date. This project will use artificial intelligence and advanced computer-based methods to develop tools that can accurately predict soil behaviour in oceans, seas, or rivers when disturbed by man-made structures. The computational methods and artificial intelligence platform developed as a part of this project will be available to all stakeholders in the industry and the academia, both domestic and international, for practical applications and future research directions. This will be achieved by publicising the research outcome through social media, the world wide web, international conferences, and the academic networks. Furthermore, these tools can be used by Australian engineering companies and government authorities when designing infrastructure to make them safer and more cost-effective. This will reduce the risk of damage or catastrophic failure, which will increase certainty in investment in multibillion-dollar offshore assets around Australia. This project will also reduce the chances of environmental damage caused when this infrastructure deteriorates, minimising the associated repair and remediation costs.												
DP240100753	**Autonomous Discovery of Green Inhibitors**	85,760.00	172,787.50	179,047.50	92,020.00	0.00	0.00	529,615.00				Spain, Germany	
	The project aims to develop autonomous material design by												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
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Cole, Prof Ivan S	integrating evolutionary algorithms and robotic experimentation. The project expects to pioneer a new method of materials discovery that could cut discovery times to 20% of traditional methods. Its expected to have significance through its discovery of new classes of corrosion inhibitors that are safe to both humans and the environment. The expected outcomes of this project will be a rapid discovery methodology that can be used across materials science and new classes of safe corrosion inhibitors. This should provide significant benefits to workplace n safety and the environmental impact of the coatings industry while also increasing the rapid of innovation of new materials.												
	National Interest Test Statement												
	Innovation in new materials is very slow and in fact large, engineered structures, aircraft, industrial equipment are often designed and developed in shorter times than the materials to be used in them. This mismatch can mean that by the time a new material is developed it is no longer needed. Further as development time and costs are high only a fraction of the possible material designs is explored. The project has two main aims; to develop new rapid methods for discovering novel materials, and to develop a fundamental understanding of metal corrosion. The research will benefit the Australian community as the development of faster discovery methods will lead to shortened development times in such applications as protection of metal surfaces, battery electrodes and catalysts for both environmental protection and new energy sources. New understanding of corrosion will enhance corrosion protection across the automotive, infrastructure, mining, defense and energy industries. This is critical as government regulation and concerns for human safety and the environment are leading to the phasing out of traditional corrosion protection methods based on toxic compounds. The work will be disseminated to the scientific and industrial communities both through RMIT's extensive network of partners and through scientific publications while it will be made known to the general public through virtual media posts.												
DP240100830 Yu, Prof Xinghuo	**Variable Structure Complex Network Systems with Smart Grid Applications** This project aims to establish a breakthrough theory and technology to help deliver reliability and security of complex network systems, which are subject to structure changes, against faults and cyberattacks. Expected outcomes include a new theory that lays the foundation for understanding such systems, innovative algorithms and tools for their design, and a practical software platform used for ensuring reliability and security of such systems. It will be applied directly to critical infrastructure such as the national power grid to help maintain lifeline resilience and achieve economic benefits. It will also provide an opportunity to train the next generation engineers in this cutting-edge technology for Australia.	79,093.00	165,136.50	174,586.00	88,542.50	0.00	0.00	507,358.00			Hong Kong (SAR of China), Netherlands, Italy		
	National Interest Test Statement												
	Reliability and security of critical infrastructure such as the national power grid are critical for lifeline resilience and economic developments. This project aims to develop new algorithms and tools that can be used to ensure the reliability and security of the power grid despite unexpected faults and cyberattacks in complex dynamical situations, for instance power grids under extreme weather conditions and malicious cyberattacks. These algorithms will be developed and tested in the laboratories at participating universities and adopted in the collaborative projects with industry partners to enhance power grid reliability and security capabilities. Proof-of-concept platform technology is expected to be built and tested, ready for commercial implementation after the completion of the project. Impactful outcomes include a more robust national power grid with renewables against extreme weathers and cyberattacks. This research will provide economic, environmental and commercial benefits to Australia by ensuring the community has a reliable power supply through using renewable energy, and providing a new technology that can be developed in Australia for commercial benefit.												

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240100963 Jalili, Prof Mahdi	**Congestion control in complex networks with higher-order interactions** Traffic congestion significantly costs the Australian economy and environment. This project aims to develop ground-breaking network models of urban traffic systems to build a new congestion control framework. The purpose of network modelling is to capture the interdependence between different parts of traffic systems, which facilitates studying congestion cascade within the network. The project expects to generate next generation of network models for more effective congestion control. Expected outcomes include novel congestion control technologies that adjust traffic signals in real-time to optimally utilise the available road space. This should provide significant economic and environmental benefits to Australians by easing traffic jams.	82,543.50	167,587.00	172,587.00	87,543.50	0.00	0.00	510,261.00			England, United States of America, Slovenia		
	National Interest Test Statement Network science provides efficient tools to model critical infrastructure systems by capturing interdependence between their elements. Urban traffic systems are examples of such systems that can be modelled as networks. Congestion is an inevitable element of traffic systems, and can have significant destructive environmental and economic consequences if not properly managed. It is estimated that traffic congestion on our roads costs the Australian economy around $20 billion annually. There is a lack of realistic network models for urban traffic systems that can accurately consider indirect relationships in the modelling process. This project aims to develop such models, which will then be used to design more efficient congestion control and management strategies. The project outputs will be new models of congestion dynamics and machine learning based control strategies to ease congestion on Australia's roads. The project outcome will reduce congestion and traffic jams on Australia's roads, delivering significant economic and environmental benefits to the community. It will provide a technology that can be developed in Australia to better control and manage congestion in Australia's critical infrastructures.												
DP240101032 Tari, Prof Zahir	**Preventing Exfiltration of Sensitive Data by Malicious Insiders or Malwares** Data exfiltration is a serious threat as highlighted in recent leakage of sensitive data that resulted in huge economic losses as well as unprecedented breaches of national security. The aim of this project is to develop a comprehensive and robust solution for detection and prevention of sensitive data exfiltration attempts by malware and unauthorised human users. Expected outcomes include scalable monitoring methods and efficient algorithms that will be able to prevent real-time exfiltration and identify previously undetected exfiltration of sensitive data. This should provide significant benefits to governments, defence networks as well as businesses and health sectors, as it will protect them from sophisticated cyber attacks.	81,558.00	167,874.00	175,129.00	88,813.00	0.00	0.00	513,374.00					
	National Interest Test Statement Unauthorised data extraction from a computer, or data exfiltration, is a serious problem which may have catastrophic effects on businesses, governments and other organisations possessing sensitive data. Recent outbreaks of ransomware are some examples of new data exfiltration-based attacks for the purpose of financial gain. Not only are attack methods becoming increasingly sophisticated, but most of the advanced hacking is conducted by state-sponsored hackers. This project will develop innovative solutions to detect sensitive data leakage in computer systems, caused by unauthorised human users, as well as hidden malicious software that existing detection engines fail to												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	identify under certain circumstances. The outcome of this project will be models, methods and software solutions that will help secure the data of government and intelligence agencies, defence networks as well as businesses and health sectors. Industry workshops, through the Cremone Digital Hub (where RMIT is one of the contributors), will be conducted to help small-to-medium enterprises protect their data and systems from cyber-security threats.												
DP240101131 Wen, Prof Cuie	**Innovative Zn alloys with essential mechanical and biofunctional properties** This project aims to develop a breakthrough understanding of the impact of alloying additions on the strengthening mechanisms, degradation behaviour, antibacterial properties and biofunctionalities of zinc alloys. The project expects to generate new knowledge in alloying strategies, plastic deformation and surface modification of zinc alloys to achieve mechanical, corrosion and biofunctional properties satisfying the requirements of biodegradable metallic materials. The expected outcomes are the development of novel zinc alloys and practical technologies for industry applications, such as thermomechanical processing and surface coating. The benefits are expected to extend to physical metallurgy and biomaterial manufacturing.	91,635.00	187,185.00	195,012.00	99,462.00	0.00	0.00	573,294.00			United States of America		
	National Interest Test Statement Current metallic biomaterials used for weight bearing applications such as titanium alloys and stainless steels do not degrade in the body. This leads to the need for a second surgery to remove the medical device. The proposed project will develop new biodegradable zinc alloys with customisable degradation and mechanical properties. New surface-modification techniques will give the zinc alloys biofunctional properties, such as stimulating bone formation and antibacterial activities. The knowledge gained will enable the development of novel biodegradable metals as implant materials with appropriate biodegradability, high mechanical strength, and bone regeneration and bactericidal properties. This, in turn, will reduce the healthcare burden in Australia for musculoskeletal conditions. It will also position Australia as a leader in the biodegradable metals research field and provide the Australian biomaterial and medical device manufacturing industries with distinct competitive advantages. Overall, the new materials and manufacturing technologies developed by this project will benefit Australia's manufacturing industries in general, through innovative techniques for plastic deformation and surface modification.												
DP240101211 Bao, Prof Zhifeng	**Scaling Disk-Resident Learned Indexes For Database Systems** This project aims to investigate new disk-resident learned indexing algorithms to store and process data in database systems by advancing the state-of-the-art in memory-resident learned modeling. This project expects to generate new knowledge in the area of digital storage technologies utilising novel and efficient techniques in learned indexing for big data. This should provide significant benefits to enable modern database systems to scale with the massive growth of data, improve the efciency of data processing, improve the effectiveness of projects that utilise big data, and dramatically reduce energy costs in Australian data centres when storing and retrieving data from databases and lower their carbon footprints.	75,000.00	150,000.00	150,000.00	75,000.00	0.00	0.00	450,000.00			Singapore		
	National Interest Test Statement The amount of data being generated is expected to reach 163 zettabytes by 2025, which is double the amount of data generated in 2022. That is, every single internet user generates around 2 megabytes of stored data per second.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	Australia is the sixth largest country in terms of the number of data centres in operation, accounting for about 1% of all data being stored worldwide. Australia can expect to be storing 1.63 zettabytes of data, and the associated energy costs to store this amount of data are estimated to be $22.1 billion dollars. This project aims to create new algorithms for storing and manipulating data. These algorithms have the potential of reducing the total amount of data stored by a factor of 10, and at the same time be a factor of 3 more efficient. Together, the total estimated energy costs would drop from $22.1 billion dollars to $730 million dollars, providing an enormous reduction in the carbon footprint in Australian data centers as well as reducing pressure on energy suppliers in Australia. We aim to disseminate our findings through both academic and industry related conferences, and to make open-source prototypes of all algorithms created freely available, allowing researchers to extend our results, and allowing industry and government agencies to adopt these new approaches into current data center software.												
DP240101215 Daeneke, A/Prof Torben J	**Liquid Metal Interfaces – A Novel Platform for Catalysis** This project aims to develop the basic design principles that govern the performance of liquid metal alloy catalysts for the methane pyrolysis reaction and manufacturing of ammonia. The project expects to generate new knowledge in understanding the reaction dynamics occurring at the gas-liquid metal interface under true working conditions and the composition-catalytic activity relationships of multi-component liquid alloy catalysts through a combined experimental and computational/theoretical approach. The expected outcomes are new liquid metal alloys that open the gateway to a new dimension of catalytic applications. The project should benefit Australia's key societal challenges of emissions reduction, hydrogen storage and food security.	77,509.50	151,217.50	150,861.50	77,153.50	0.00	0.00	456,742.00					
	National Interest Test Statement This project will develop new materials to address two critical problems that our society is facing: greenhouse gas emissions and food security. Modern agriculture is dependent on the production of ammonia, a chemical ingredient for manufacturing fertilisers. However, producing ammonia requires hydrogen and a lot of energy, leading to the release of vast amounts of carbon dioxide. This project will create new systems for manufacturing ammonia and hydrogen, making Australia less reliant on international supply chains. Importantly, our methods are capable of producing hydrogen from natural gas without emitting any carbon dioxide. Our novel approach utilises metals that are liquid at room temperature and that are capable of making ammonia production more efficiently. This will help Australia to meet its ambitious climate targets. The results from this project will be adopted by the fertiliser production industry by being incorporated into existing manufacturing processes, while also offering new ways to produce clean hydrogen that can be used to help decarbonise the transport sector.												
DP240101430 Chen, Dr Xiao-Bo	**Corrosion triggered self-passivation of magnesium alloys** This project aims to sustainably protect magnesium alloys from aqueous corrosion in engineering services through an unprecedented self-passivation mechanism (analogues to stainless steel). This project is expected to generate new knowledge in the area of passivation mechanisms for magnesium alloys in corrosive environments through high-throughput screening and in-situ corrosion characterisation at atomic scale. This should provide significant benefits, such as enabling the debut of a scientific strategy to transform the magnesium alloy market with respect to end use (such as electric car industry), energy composition and emissions, which has significant industrial interest as it will provide new opportunities to minimise carbon footprint.	42,370.00	91,130.00	95,880.00	47,120.00	0.00	0.00	276,500.00			Netherlands, United States of America, Germany		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	The use of alternative energy sources (such as hybrid, or electricity) driven cars alleviates some of the environmental impact of using fossil fuels on global warming, but these technologies continue to require light materials to maintain fuel efficiency. This project promises to boost the implementation of magnesium alloys (the lightest engineering metal) in the transport industry through inventing a self-passivation strategy to manage the corrosion challenge, which is high on the agenda in magnesium-works globally. The expected outcomes include a feasible self-passivation strategy to trigger and regulate the electrochemical responses upon magnesium alloys in corrosive environments through high-throughput screening and in-situ corrosion characterisation at the atomic scale. New understanding of self-passivation will enhance the commercialisation of light-weighted magnesium alloys across the aerospace, automotive, infrastructure, and energy industries. In addition, the role of light metals research in Australia remains a high national priority with regards to value adding our natural resources, subsidising carbon emission, maintaining the lead in development of advanced materials, and building up excellence in light metals research in relation to both fundamental and practical aspects for which Australia holds an enviable track record.												
DP240101579 Khoshmanesh, A/Prof Khashayar	**Microfluidics to explore the uptake of nanoparticles by endothelial cells** This project aims to develop microfluidic technologies for generating lipid nanoparticles with customised properties and investigating their delivery to endothelial cells under various flow dynamics. The project expects to advance our fundamental knowledge of biophysical and biological mechanisms underlying the uptake of lipid nanoparticles by endothelial cells. Expected outcomes of this project include enhanced delivery of nanoparticles to vessel walls. This should provide significant benefits, such as establishing a framework for designing future nano delivery systems, which would benefit Australian biotechnology industries.	81,924.50	164,593.50	163,713.50	81,044.50	0.00	0.00	491,276.00			Netherlands, England, Switzerland		
	National Interest Test Statement Nanoparticles have emerged as effective vehicles for delivering chemicals to cells. However, progress in the development and translation of nanoparticles is hampered by the limitation of the existing methods to examine the delivery of nanoparticles to blood vessel walls under the complex environment of blood vessels. To address this critical gap, this project will pioneer technology platforms to generate lipid nanoparticles with tailored properties and to test their delivery to endothelial cells under tailored flow conditions occurring in blood vessels in a systematic manner. The project will advance our fundamental knowledge of biological mechanisms governing the uptake of nanoparticles by endothelial cells. The fundamental discoveries and technologies made during this project will contribute to the future development of nano delivery systems. This will benefit the Australian biotechnology industries, leading to generating high-tech manufacturing capability, and creating hundreds of highly skilled jobs. This research and its commercial development through the Australian biotechnology industries will ensure our prosperity in this market. The research team will harness the power of traditional and social media to promote their research outcomes beyond academia and will attend industry events and organise workshops to engage with industry partners.												
DP240101825 Zhai, Dr Jiali	**Deciphering lipid-RNA nanocarrier structure upon RNA complexation** This project aims to decipher the nanostructure evolution, at a millisecond timescale, of lipid self-assembly upon coupling with RNAs and track the nanocarrier structural changes induced by biologically relevant acidic environments. This project will generate new knowledge of the interplay between the self-assembled lipid-RNA nanostructures and cellular objects for successful payload release. The expected outcome of this project is identification of the fundamental mechanisms of lipid-RNA molecular self-assembly and intracellular nucleic acid delivery. This should provide significant advances in the field of lipid nanoparticle engineering for the delivery of RNA therapeutics.	81,567.50	169,288.00	173,941.00	86,220.50	0.00	0.00	511,017.00			France		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	Lipid nanoparticles (LNPs) as gene delivery vehicles are composed of multiple lipid components coupled with nucleic acid molecules, called complexes, with a typical size around 100 nm. The exact nanostructures of these complexes, and the dynamic structural evolution to the final state, can be complicated and are related to the ability to exert intended biological functions. This project aims to decipher the unknown nanostructures of lipids upon coupling with nucleic acids such as mRNA and DNA, as well as the structural change after entering the target cell's acidic environment. Understanding the mechanisms of structural formation and their correlation with nucleic acid delivery to cells will lead to insights including the identification of fundamental lipid-nucleic acid molecular interaction mechanisms, nanoscale structural changes and kinetics, and intracellular trafficking mechanisms, which could lead to fast-tracked, rational engineering of future LNPs. This project aligns with Australia's national interests to foster cutting-edge nanobiotechnology, combined with innovative usage of our national research infrastructure. Over a longer term, through more successful translation of LNP technology for delivery of genetic materials, pharmaceutical and agricultural industries may generate profound economic benefit and the final products may benefit our society in terms of improved quality of human life, animal health, and food security.												
DP240102140	**Data Privacy Protection in Wireless Sensor Networks**	75,885.00	153,935.00	158,262.00	80,212.00	0.00	0.00	468,294.00					
Yi, Prof Xun	This project aims to explore a comprehensive solution for the protection of privacy-sensitive data in wireless sensor networks (WSNs) that are vulnerable to hacking. The project expects to use an innovative approach involving multiple data servers to protect sensor data privacy from data collection to data access and analysis. Expected outcomes of this project include new security and privacy models for WSNs in the setting of multiple servers, new secure protocols, privacy-preserving access control and data analysis protocols, and a prototype of a privacy-preserving WSN system. This should provide significant benefits, such as improved security of sensitive data in the healthcare system, military, utilities and telecommunications.												
	National Interest Test Statement												
	A wireless sensor network (WSN) is a spatially distributed sensor network that collects data from remote locations and transmits it wirelessly to a central location. Data collected by WSNs, including physiological, consumption, and location data, are highly sensitive. Unauthorised disclosure can have serious consequences, potentially resulting in harm or loss of life. As such, safeguarding data in WSNs is of paramount importance. This project addresses a significant problem: how to protect privacy-sensitive data in WSN. The research outcomes will significantly enhance data privacy and security protection in WSNs, thereby promoting their wider applications. Notably, the body-worn WSNs can reduce hospital stays while maintaining constant contact with healthcare providers. This project ensures the secure transmission and storage of patient data in healthcare databases, benefitting the Australian government in cutting healthcare costs. WSNs can also provide real-time war pictures and better situational awareness, improving troop readiness and decreasing reaction time. This project's outcomes can secure military data transmission, benefiting the Australian government in cutting military costs. The outcomes will be translated to commercial products and deployed to various WSNs enabled services, such as a privacy-preserving WSN platform for healthcare services, ultimately contributing to a safer wireless sensor network infrastructure.												
DP240102585	**Networks: New links between spectrum, dynamics, rewirings and applications**	77,760.00	158,310.00	131,623.50	51,073.50	0.00	0.00	418,767.00			France, England		
Stone, Prof Lewi	Modern network science has transformed the study of complex systems and led to innovations in many disciplines. This project intends to develop breakthrough theories for control of complex networked system behaviour via interventions of the link-rewiring type. New approaches will be developed for non-random, assortative and/or structured networks, which are poorly understood and difficult to deal with, despite being the real-world norm and despite their impact. The results will give new insights into epidemic outbreaks and their impact on vulnerable groups (e.g., elderly and indigenous), and provides methods to												

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	enforce resilience of infrastructure networks such as power grids, thereby providing significant economic and societal benefits. **National Interest Test Statement** The project intends to solve problems that exist at the very foundations of network science, and thus has the possibility of putting Australia prominently and actively on the map in this rapidly growing field of science. The project has a focus on disease spreading in “networks of human contacts” and resilience of “infrastructure networks.” New theory will be presented to predict network properties of interest from their structure, and new methods of targeting interventions (adding/removing links) to amplify the desired behaviours in such systems. For critical infrastructure, e.g., power grids and communication networks, methods will be developed to target minimal rewiring (of transmission links) that guarantee the largest possible effect in preventing breakdowns due to failures, errors, and malicious attacks. Avoiding catastrophic failure of critical infrastructure via minimal investments can potentially bring significant economic and environmental benefits to Australia and its people. The focus on epidemics will provide new insights into mitigating outbreaks that spread rapidly through populations, with particular examination of vulnerable groups including the indigenous and elderly. The latter faced particularly difficult problems in Australia at the highest mortality rates during the COVID pandemic. Australian advances in these areas can help prepare for, or even prevent future hazards, and thus will be of considerable National Interest.												
DP240102825 Tolcos, A/Prof Mary	**The capacity for exceptional brain repair in a novel rodent species.** This project aims to provide a new and much-needed living tool for studying brain injury and repair. The project expects to generate new evidence of effective brain repair in a mammalian species, the spiny mouse. In particular, it will provide important knowledge of the cellular responses that coordinate to allow mammalian brain repair, revealing targets for future understanding and treatment. Expected outcomes include an in-depth characterisation of how neurons and non-neuronal cells (glia) contribute to brain repair, and the identification of new pathways or targets for mammalian brain repair. In the long-term this should provide significant benefits for future research focused on improving the lives of people affected by brain injury. **National Interest Test Statement** The adult mammalian brain is said to be incapable of healing from injury. This project aims to uncover the unique biological responses which enable brain repair in a mammal that has evolved non-typical healing responses in several other organs. In this project, we will create an advanced biological research tool with the potential to generate a blueprint of how effective mammalian brain repair can be achieved; we expect that this research tool will be adopted by other researchers to study brain regeneration but will also have applications for injury to other organs. As such, the project will generate (i) a new research tool and new knowledge to enhance the capacity for regeneration research in Australia, and (ii) a brain repair database, shared via a publicly hosted repository, which may be used by others to identify potential drug targets to improve outcomes for patients suffering brain injury, both with long-term economic and social benefits. The drug targets could also be adopted by the Australian pharmaceutical industry to develop new products and increase its international market share, expanding and creating new jobs, and stimulating commercial and economic growth. The project will also provide training to local researchers in processing complex biological data, bringing novel and sought-after expertise to Australia.	88,244.50	177,924.50	179,818.00	90,138.00	0.00	0.00	536,125.00			France		
	RMIT University	1,227,658.50	2,501,750.00	2,552,231.50	1,278,140.00	0.00	0.00	7,559,780.00					
Swinburne University of Technology													
DP240100248 Liu, Prof Xia-Ji	**Making Strongly Interacting Photons** This theoretical project aims to investigate strongly correlated polaritons in quantum physics. Known as quantum fluids of light, polaritons are half-light, half-matter	69,421.50	146,453.00	159,008.50	81,977.00	0.00	0.00	456,860.00			United States of America, Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	particles exhibiting frictionless, zero-energy-cost flows, an astonishing quantum behaviour known as superfluidity. This project expects to make a breakthrough in our understanding of polaritons in the strongly interacting regime far from equilibrium and fill in the knowledge gap towards the realisation of a superfluid of light at room temperature. This should open a new era of quantum polaritonics that forms the basis for energy-efficient laser and all-optical transistor, establishing Australia as a world leader in commercialising novel photonic technologies.												
	National Interest Test Statement												
	Photonics, which involves the generation, manipulation, and detection of light in the form of photons, has a wide range of scientific and technological applications in our daily lives. These include medical diagnostics, biological and chemical sensing, and telecommunication technologies such as the internet. However, these technologies typically operate in the classical regime, requiring a huge number of photons and notable energy costs, posing a serious challenge to energy affordability in Australia and globally. One way to address this challenge is to push photonics to the extreme limit of the quantum world, where it can operate at an extremely low power level, one trillionth or billionth of a watt. However, achieving this requires a very strong interaction between photons, which is currently a major obstacle in modern photonics. Our project aims to overcome this obstacle by addressing several grand theoretical challenges involved in creating strongly interacting photons using a device that confines photons between two high-quality mirrors and couples them to an electronic dipole to form half-light, half-matter quasi-particles called polaritons. The knowledge generated from this project will be shared with industry to facilitate the development of energy-efficient, low-cost quantum photonics such as ultra-low-threshold polariton lasers and practical all-optical transistors, which could reduce energy costs and consumption for Australians and people around the world.												
DP240100896	**Bubble clouds in ocean waves**	88,636.00	176,584.50	182,097.00	94,148.50	0.00	0.00	541,466.00					
Manasseh, Prof Richard	This project aims to predict the behaviour of bubble clouds in ocean waves. Bubble clouds are used in Europe to shield marine mammals from the dangerous noise of offshore wind-turbine construction, but would be dispersed by Australia's ocean swell and turbulence; and unlike in Europe, Australia's offshore-wind sites are frequented by endangered whales. Bubble clouds from breaking waves may also dissolve up to third of humanity's carbon in the ocean. Experiments and coordinated numerical simulations would predict the displacement and dispersion of bubbles in oceanic conditions. Experiments and simulations would then predict the acoustic behaviour of bubble clouds. This outcome would benefit new offshore-wind industries and climate science.												
	National Interest Test Statement												
	This project will deliver data on the behaviour of air bubbles under ocean waves. Coordinated experiments and computer simulations will measure where bubbles go and how they block underwater noise. The construction of offshore wind turbines, proposed to begin in Australia as soon as 2025, generates dangerous noise levels as piles are hammered into the seabed, potentially damaging marine-mammal hearing. In Europe's North Sea, clouds of bubbles from air hoses on the seabed form 'curtains' blocking this noise, protecting small, dolphin-like animals which are not endangered species. However, unlike in Europe, Australia's wind-turbine sites feature ocean swell and turbulence that would degrade existing bubble curtains. Furthermore, Australian wind-turbine farm sites are frequented by huge, endangered whales, the Southern Right Whale and Blue Whale, and also the Humpback Whale, bringing us over a quarter of a billion dollars annually in tourist income. Expected project outcomes would be an understanding of bubble behaviour in ocean swell, valuable for models of how bubble clouds drive the ocean's absorption of atmospheric carbon dioxide; and a prediction of the sound-blocking ability of bubble clouds in ocean swell. This would enable new bubble-curtain designs for a number of ocean industries, and may also give Australia's defence industries an edge in new technologies for the control of low-frequency underwater noise, a key to detecting submarines over very long distances.												
DP240101075	**Developing systemic interventions for intimate partner financial abuse**	105,496.00	189,930.00	84,434.00	0.00	0.00	0.00	379,860.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Cook, Prof Kay E	This project addresses the significant national problem of intimate partner financial abuse, which continues long after women leave abusive relationships. It works with frontline service providers and victim survivors to identify how financial abuse is perpetrated through financial, legal and government systems, and develops a framework for understanding post-separation financial violence. It harnesses policymakers' and practitioners' expertise through co-design workshops to develop practical solutions and a framework to implement them. The application of Safety by Design principles within implicated systems will benefit affected families, by closing down avenues for the perpetration of financial abuse. **National Interest Test Statement** This project has significant policy and practical relevance, responding to key areas of national interest and concern. It responds to the Commonwealth Government's Fifth Action Plan of the National Plan to Reduce Violence against Women and their Children 2022-2032 that specifies the need for the financial sector to build its capacity to prevent and respond to financial abuse. Similarly, the federal Joint Select Committee Inquiry on Australia's Family Law System identifies child support as a system through which post-separation financial abuse can be perpetrated. But very little is known about how such abuse can be prevented. This project foregrounds the experiences of the most vulnerable women who experience financial abuse within the context of intersectional disadvantages. By designing solutions that will work for the most vulnerable the project develops interventions that will be effective for all women experiencing financial abuse. Working with policymakers and practitioners the project develops an implementation framework to drive changes within and across sectors. As a result, this project will ensure that financial safety is prioritised across the entire post-separation financial, legal and government service system, providing benefits to victim survivors as well as all Australians. The project will produce economic benefits as a result of improved child support compliance and reduced social welfare costs. It will lead the world in solving this pressing social problem.												
DP240101301 Gad, Prof Emad	**Robustness-oriented and serviceable design of innovative modular buildings** This project aims to unlock the full potential of prefabricated modular buildings through innovative framing solutions in combination with new evaluation methods to enhance serviceability and improve safety under extreme events. Advanced 3D hybrid testing and analysis will be used to create new knowledge on the complex system-level dynamic behaviour of modular buildings. The expected outcome of this project will lead to safe, affordable, and environmentally sustainabe modular building construction. The project will provide significant benefits to designers, manufacturers and regulators to improve the resilience of the building stock and to support greater design and manufacturing innovations. **National Interest Test Statement** While lightweight steel framed (LSF) systems, particularly in form of prefab and modular systems, can support the need for resilient and sustainable construction, the state of understanding their complex behaviour in relation to serviceability and robustness against extreme events remains relatively limited. Modular buildings in Australia generally have limited capacity against disproportionate damage resulting from natural and man-made hazards, posing significant safety risks, especially for post-disaster buildings that must perform at elevated levels. Further, increasingly multistorey buildings are reported to suffer unexpected damage to non-structural elements and loss of amenity under service loads. This project aims to develop an innovative modular framing system in combination with new performance assessment and design methods that will enhance the welfare and safety of building occupants and reduce construction costs. Fundamental knowledge developed in this project would lead to the development of affordable prefab modular structures to help with disaster recovery that will benefit Australia in terms of disaster response nationally and put it at the forefront of international disaster response and recovery. The outcomes of this research will be incorporated into the National Association of Steel-Framed Housing (NASH) Standard which is referenced in the National	80,243.00	144,509.50	102,762.50	38,496.00	0.00	0.00	366,011.00			New Zealand		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Construction Code (NCC) and widely used by system developers, design engineers, fabricators, and builders.												
DP240101590 Hannaford, Prof Peter	**Big time crystals: a new paradigm in condensed matter** This project aims to extend condensed matter physics to the time dimension using big time crystals created by a periodically driven Bose-Einstein condensate. Such a system is expected to offer exceptional versatility, allowing effective potentials and long-range interactions in a time lattice to be engineered almost at will by proper periodic driving and modulation of the particle interaction. Expected outcomes include realisation of novel condensed matter phenomena such as topologically protected states in the time dimension, time crystalline structures exhibiting disorder or quasi-crystalline order and time-tronics devices analogous to electronics. Potential future benefits include novel advanced materials and semiconductor-like devices.	71,345.00	192,345.00	195,482.50	74,482.50	0.00	0.00	533,655.00			Poland, Japan		
	National Interest Test Statement This project aims to apply a newly discovered form of quantum matter - a so-called time crystal involving ultracold atoms that crystallise in time rather than in space - to realise novel condensed matter phenomena in the time dimension. Novel condensed matter systems that have recently been predicted include semiconductor-like devices such as transistor devices and memory devices that operate and store information in the time dimension rather than in space. Condensed matter systems in the time dimension have the potential to benefit the future development of new advanced materials and novel semiconductor-like devices for the electronics and materials engineering industries. The project is at the forefront of the highly competitive field of ultracold quantum gases and involves novel quantum phenomena that promise to attract, inspire and provide excellent training in optics, lasers and quantum physics for the next generation of young STEM scientists. The research outcomes will be promoted to a broad range of audiences through the Swinburne Media Centre and the Swinburne Optical Sciences Centre website.												
DP240101708 Huang, Prof Xiaodong	**Optimisation of Buildable Structures for 3D Concrete Printing** This project aims to establish a systematic approach to seamlessly integrate optimisation, characterisation, and 3D concrete printing (3DCP) manufacturing for the construction and building industry. New optimisation algorithms will first overcome the manufacturing limitations of 3DCP by considering the print path and early-age concrete properties, and directly create high-performance and innovative designs of buildable structures. The outcomes of this project include a powerful design tool that enables architects and engineers to optimally design and construct the next generation of cost-saving and aesthetically pleasing buildings and infrastructures through the adoption of modern 3DCP technology.	94,918.50	192,651.50	165,247.50	67,514.50	0.00	0.00	520,332.00					
	National Interest Test Statement Automated 3D concrete printing (3DCP) offers a quick and cost-efficient way of fabricating the next generation of buildings and infrastructures, but the design method and tool for this modern production technique are urgently needed. The project will fill a significant knowledge gap between topology optimisation and 3DCP manufacturing and develop an optimisation-based design method for the 3DCP production. The outcomes of this project include a series of topology optimisation algorithms and computer codes, and novel high-performance structures for concrete printing. This research will greatly shorten the product development cycle and reduce labour costs and material wastage in trial 3DCP fabrication, making the Australian construction industry more competitive and productive. The developed computer codes will be packaged into a powerful and easy-to-use design tool for 3DCP production. The research outcomes will be promoted through lab demonstration and industry collaboration and adopted by Australian architects and engineers to create and construct their-own high-performance, sustainable, and eco-friendly concrete structures.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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DP240101851 Russell, Prof Sarah M	**Mapping the integration of T cell fate control across time and space** This project aims to apply new methods to determine how coordination of signalling complexes impacts upon the fate of cells of the adaptive immune system. It expects to determine how the context of signallng orchestrates cell fates such as differentiation, death and proliferation. The project is expected to yield an experimental and analytical platform for further investigations into a broad range of biological questions, and to provide new knowledge of this fundamental problem. This platform should support further work that ultimately provides new models for tissue and immune cell regeneration, and new manufacturing platforms for therapies for humans and livestock, among other benefits.	104,706.00	218,651.50	227,291.50	113,346.00	0.00	0.00	663,995.00			United States of America, Italy		
	National Interest Test Statement How do multicellular animals develop from a single fertilized egg? To date, developmental biologists have learnt much about the components of how development is controlled. However, a key missing element is understanding exactly how our ‘adaptive immune cells’ (T cells and B cells) develop so as to provide immunity to the wide variety of pathogens or cancers. Immune cells that are too aggressive can attack the ‘self’ and cause auto-immune conditions, so it’s also essential to understand how the body ensures that only cells with the right degree of effectiveness survive. New biological and computational technologies provide previously unimaginable opportunities to understand T cell development. This project combines these areas to form a comprehensive understanding of the control of T cell development in the mouse. Immediate benefits are better fundamental understanding of biological systems, enhancing Australia’s stellar reputation in immunology and developmental biology, and showcasing a multidisciplinary methodological approach to set the standard for more cost-effective biological experiments. These findings will then lay the foundation for further studies that have potential applications in tissue engineering for both humans and livestock. In the long-term, this research will assist precision design and understanding of the long-term durability of tissue for uses such as artificial organs and transplants, as well as development of better immunotherapies for cancer.												
DP240102164 Xiang, Prof Yang	**Attribution of Machine-generated Code for Accountability** Machine-generated (or neural) code is usually produced by AI tools to speed up software development. However, such codes have recently raised serious security and privacy concerns. This project aims to attribute these codes to their generative models for accountability purposes. In the process, a series of new techniques are developed to differentiate between the codes generated by different models. The outcomes include analysis of neural code fingerprints, classification of neural codes, and theories to verify the correctness of code attribution. These will provide significant benefits, ranging from copyright protection to privacy preservation. This project is timely since currently the software community is pervasively using neural codes.	78,811.00	162,576.50	169,744.00	85,978.50	0.00	0.00	497,110.00					
	National Interest Test Statement ChatGPT has taken the world by storm. Users are attracted to its advanced capabilities. As a matter of fact, along with the recent advances in artificial intelligence, ChatGPT is only a typical example among the many instances (e.g., CodeX and Copilot) that do the same job. In this project, we mainly focus on one popular function of ChatGPT-like AI-based models, i.e., generating code (called neural code) which tries to relieve humans of unnecessary coding efforts. It is being widely used in software development now. However, neural codes have introduced significant security and privacy issues because they may contain copyrighted material, vulnerabilities or sensitive information such as residential addresses and phone numbers. This project is the first to attribute neural codes to their generative models for accountability purposes. Attribution of codes and holding the generator(s) accountable, reduce the risks of using												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	digital techniques in Australia. This project will promote Australian national security, lower the barriers of data sharing, and provide law enforcement with independent, expert and scientific advice on code accountability. The research outcomes can be immediately used by governments and industry to do forensic jobs. By attributing the responsibility of AI models, the society can prevent the misuses of AI techniques and maintain equality between people.												
DP240103207 Ogloff, Prof James R	**Examining the impact of remand and the utility of bail risk assessments** Australia has experienced soaring incarceration rates, driven by the pre-trial detention of unsentenced people pending trial, not by rising crime rates. The decision to remand a person into custody pending trial has implications for public safety and individual rights. Although the impact of remand has gained increasing importance given adverse coronial findings, no studies have examined the mental health and justice impacts of remand. This project seeks to examine the effect of remand on future crime, justice outcomes, and mental health outcomes. This project will also examine the factors associated with bail decisions and develop mathematical models designed to accurately forecast bail release outcomes and reduce demographic disparities.	69,474.00	184,341.50	190,119.50	155,633.00	80,381.00	0.00	679,949.00					
	National Interest Test Statement Over the past thirty years Australia has experienced soaring incarceration rates driven by an increase in incarceration of people who have been denied bail and remanded pending trial. This has recently led to national discussions about the extent to which remand: (1) improves community safety; (2) imposes social and mental health costs on those remanded; and (3) is being applied to those who truly pose an unacceptable risk to the community. The national debate around the use of remand would benefit by being informed by rigorous empirical research to examine the effect that remand has on both community safety and on those who are remanded. At present, bail decisions may result in too many vulnerable people being remanded into custody despite posing little or no risk in terms of community safety. Bail decision making in Australia has not benefitted from scientific advances in assessing risk. This research will address these shortcomings by assessing the impact of remand on justice and mental health outcomes and developing novel risk assessment technologies to assist with the accuracy of bail decision making by judges. This dual focus will help ensure that decisions to release or remand are informed by an empirical foundation and are more accurate than unstructured judgement and are informed by awareness of the health and justice outcomes of remand. More accurate statistical approaches can also enhance fairness in decisions across vulnerable populations.												
DP240103231 Juodkazis, Prof Saulius	**3D integrated crystalline UV optical lens-fiber couplers for astronomy** This project aims to create micro-optics for astronomical and bio medical applications by 3D sculpturing them out of crystals by ultra-short pulse lasers. This project will introduce a new 3D fabrication approach of optical probes which have self-aligned micro-optical elements and optical fibres for a wide spectral range and with high quality optical surfaces. Expected outcomes of this project include building new capabilities in micro-optical probes for industrial environments, establishing new solutions for international astronomy partners, and developing new techniques to image through optical fibres. This should provide significant benefits by improving astronomical instrumentation and also lead to less invasive endoscopy.	81,575.50	171,407.00	182,217.50	92,386.00	0.00	0.00	527,586.00			United States of America, Estonia		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Light is capable of carrying large amounts of information at high speed, and the development of new micro-optics has a proven record of success from lasers to fibre optics in telecommunication. This project will use lasers to develop a fundamentally new approach to making 3D micro-optics out of crystals. These new optical probes can be used for light collection and imaging; in the short term, the project aims to develop a next generation of original Australian technology, “StarBugs”, to be used for optical readout of signals in astronomy instrumentation and to be implemented in the Keck telescope in Hawaii, one of the world's largest telescopes. Long term, other applications for the technology include industrial, defence, space and medical imaging (e.g. endoscopy). This project also aims to develop an industrially scalable approach for 3D laser machining, which is becoming more widely used in material processing worldwide as the power of lasers increases. High precision machining with this method in Australia is currently lagging behind the leading worldwide trends, so this project also aims to support the national manufacturing priority and enhance sovereign capability to produce micro-optical solutions for industrial use and future medical applications. A new generation of researchers in laser material processing will be trained, and technology transfer of applied optics to 3D printing will be achieved.												
DP240103271 Kingshott, Prof Peter	**Nanoengineered hybrid coatings that control inflammation to artificial bone** This project aims to develop novel biocompatible surfaces using nanotechnology approaches to understand how cells attach to and grow on artificial bone materials. This research is significant because it combines novel nanofabrication and surface modification strategies for unprecedented control and manipulation of inflammatory cell behaviour relevant to orthopaedic implants. The project will overcome current limitations of uncontrollable inflammatory reactions to surfaces. The multifunctional surfaces are expected to give the biomaterials field new tools to control and maintain bone cell functionality, in vitro. Potential long-term benefits include applications as coatings in tissue engineering, regenerative medicine, and medical implants.	110,506.00	229,726.50	172,090.50	52,870.00	0.00	0.00	565,193.00					
	National Interest Test Statement This project will use advanced modern manufacturing tools to generate complex, nano-engineered coatings for use on artificial bone materials. The new surface engineering technologies developed will have application in biomedical engineering fields and tissue engineering. The research will answer many fundamental questions about how inflammatory cells interact with artificial materials in the body, and provide an understanding of how to overcome the current limitations of bone replacement materials. As the demand for new materials in the healthcare sector increases, the research outcomes will inform further development of medical materials as well as better understanding how our cells function. The new surfaces developed aim to increase the growth of bone cells and minimise inflammatory reactions, leading to reduced bone implant failure. We anticipate that our technologies will make contributions to the expansion in Australia’s research and manufacturing base in biomedical materials and enhance our international reputation in research in nanotechnology and material science.												
DP240103328 Lu, Prof Guoxing	**4D Printed Origami Structures: Deformation Mechanisms and Mechanics** This project aims to understand the physics and self-folding mechanisms of 4D printed origami structures and materials by utilising interdisciplinary approaches. This project expects to generate new knowledge in the areas of origami engineering and structural mechanics. The success of this project will form a foundation for studying shape-shifting and sequential control of smart origamis. The fundamental mechanics will be applied to characterise and design novel smart materials/structures with tuneable shape-morphing and mechanical performance. This should provide significant benefits to improvement of their safety, stability and reliability performance in applications such as space	64,196.00	128,981.50	129,398.50	64,613.00	0.00	0.00	387,189.00				England, Bulgaria, China (excludes SARs and Taiwan)	

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	engineering, wearable technology and smart robotics. **National Interest Test Statement** Origami is the art of folding paper. Over the past few decades, increasing attention has been drawn to the development of origami mathematics, as origami-based structures show desirable properties such as stability and strength. When combined with the latest 4D printing techniques, these structures become capable of self-reconfiguration like folding, unfolding, bending and twisting in reaction to certain stimuli such as temperature, water and light. Such materials will be of great use to applications in space engineering and biomedical engineering. This project focuses on understanding the deformation mechanisms and mechanics of origami-based structures and materials. The knowledge gained will lay the foundation for new inventions of shape-shifting structures and materials, providing opportunities for Australian industry to lead the world in design and manufacture of these devices. Potential applications of smart origami-based products include self-folding packaging, smart robotics, solar panels, flexible wearable devices and tissue constructs for medical uses. New inventions will provide economic benefits for Australian businesses, and applications in bioengineering and energy research have the potential to provide medical and environmental benefits both to Australia and international communities.												
	Swinburne University of Technology	1,019,328.50	2,138,158.00	1,959,893.50	921,445.00	80,381.00	0.00	6,119,206.00					
The University of Melbourne													
DP240100126 Williams, Prof Spencer	**Unlocking the secret chemistry of organosulfur biodegradation** The element sulfur is essential for life. Its transformation between organic-sulfur compounds to inorganic forms is a crucial part of the biogeochemical cycle. This project will elucidate the molecular details of the final leg of the biosulfur cycle: organosulfur breakdown into mineral form. An integrated chemical and biochemical approach will be used to illuminate how the carbon-sulfur bond is broken. This project will deliver a detailed molecular understanding of organosulfur breakdown to permit organosulfur recycling. Benefits of this research include potential biotechnology applications for breaking down xenobiotic organosulfonates and sustainable approaches to reduce dependence on agricultural fertilisers. **National Interest Test Statement** Sulfur is a vital nutrient essential for life on Earth. Many croplands and pastures in Australia suffer from sulfur deficiency, which is addressed using sulfur-containing fertilisers such as superphosphate. Paradoxically, even in sulfur-deficient soils, there are large amounts of organic compounds that contain sulfur (organosulfur) that plants cannot use because the soils lack the microbes to break it down. The pathways for breaking down organosulfur are not well understood, making it difficult to use biotechnology to improve sulfur nutrition. This project will investigate the microbial pathways for breaking down organosulfur molecules, a key research gap that is essential to understand sulfur cycling in nature. We will study the final step in organosulfur degradation, breaking the bond between carbon and sulfur. This research will deliver new insights into how nature breaks down and recycles organosulfur and will discover new biological catalysts of potential value for the Australian biotechnology industry. The research will support agricultural sustainability by informing bioengineering of soil microbes to increase crop yields and reduce reliance on synthetic fertilisers. Understanding how breakdown of organosulfur molecules is achieved can assist in reducing pollution from detergents and drugs. We will work with soil experts to encourage adoption of our research and communicate with the public through press releases and general interest articles.	80,435.00	206,489.50	207,489.50	102,935.00	21,500.00	0.00	618,849.00			England		
DP240100168 Rachel, A/Prof Stephan	**Braiding Dynamics of Majorana Modes** The project aims to investigate Majorana modes, exotic quantum particles which can be found in the new material class of Topological Superconductivity. In particular, they can be utilised to construct fault-tolerant quantum bits. Quantum logic gates are enabled by moving these	47,552.00	136,075.50	142,478.00	53,954.50	0.00	0.00	380,060.00			Germany, United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	Majorana modes around each other, i.e., by braiding them, leading to an error-free quantum performance. This project will deliver cutting-edge simulations to analyse the braiding process in condensed matter systems and benchmark how these fault-tolerant quantum bits operate under real-world conditions. By providing the theory for advanced structures and devices, this project will inform experiments and pave the way for future technology based on topological phenomena.												
	National Interest Test Statement												
	To develop quantum computers is one of Australia's top priorities. Today's quantum devices suffer from significant error rates, and thus the biggest challenge is to demonstrate fault-tolerant quantum computing systems. Once available, there will be drastic advances for the Australian industry and government in the fields of cyber security, materials and drug development, internet search engines and online databases, just to mention a few. This proposal will substantiate and improve the theoretical foundations for topological quantum computers, perhaps the most sophisticated idea of fault-tolerant quantum computing to date. Topological quantum devices are based on topological superconductors, an exotic state of matter which has been intensively studied over the past decade. While the basic idea of those systems is well established, so far it has never been systematically investigated or experimentally realized. Here we will address the former by analyzing and simulating every single step of a future topological quantum computer such as quantum bit initialization, implementation of quantum gates and the readout process. The successful outcome of this proposal will inform future experiments and help paving the way for the next generation of quantum devices. Since there is increasing public interest in quantum research, we engage with the public by writing for The Conversation and Pursuit and by performing outreach activities with high school students.												
DP240100169	**Body Worn Camera Evidence and Assessment of Witness Credibility**	37,425.50	107,723.50	136,677.50	66,379.50	0.00	0.00	348,206.00			England		
Roberts, Prof Andrew J	The aim of this project is to establish how the use of Body Worn Cameras to record statements in domestic and family violence cases affects assessment of a complainant's credibility at trial. It will generate new knowledge about the influence of: (i) the physical environment in which recordings are made, (ii) the audio and visual quality of recordings, and (iii) fact-finders' (judges and jurors) emotional responses to recordings. Expected outcomes of the project include law reform and policy recommendations to improve the practice of recording victim/witness statements and management of the use of such evidence in criminal proceedings.												
	National Interest Test Statement												
	The project is concerned with the use of Body-Worn Cameras to record complainant-witness statements when the police respond to calls for assistance in domestic violence cases. In trials, these recordings can be played instead of the complainant having to give in-person evidence. This research will investigate whether certain aspects of these recordings might bias judges' and juries assessment of the truthfulness of the complainant. These aspects include the background seen in the recordings, the audio and visual qualities of the recordings, the emotion displayed by the complainant, and judges' and juries' emotional responses to the recordings. There has been no previous empirical research on these issues. The results of the research will be published and disseminated through our network of criminal justice system stakeholders. This research will produce significant social benefit by informing and shaping police, prosecutors' and judges' decisions about the production and use of Body-Worn Camera recordings in ways that promote justice and fair trials.												
DP240100408	**How age & sex impact the transcriptional control of mammalian muscle growth**	102,721.00	263,730.00	331,641.00	170,632.00	0.00	0.00	868,724.00			United States of America		
Gregorevic, Prof Paul	Maintaining healthy muscle is crucial throughout all stages of life. Aging is associated with the loss of muscle and older muscles are resistant to growth due to age-related changes												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	in gene expression and responsiveness. Many genes are expressed differently in male versus female muscle, which may have implications for sex-differences in muscle growth and aging. This project will generate new knowledge on which genes and biological pathways are crucial in determining mammalian muscle size and growth across the lifespan and between the sexes. Application of this knowledge may lead to future approaches to enable a healthy start to life and promote healthy aging in Australians and have implications for agriculture and muscle as a food source.												
	National Interest Test Statement Our ability to move, breathe, communicate and maintain an independent lifestyle is reliant on having healthy skeletal muscles that can adapt and grow as physical needs require. How the processes that enable muscle growth are regulated at the gene level remains poorly understood. This fundamental knowledge gap is holding us back from opportunities to improve the lives of not only humans, but animals as well. This project will provide fundamental insights into how the potential for adaptive skeletal muscle growth in mammals changes across the lifespan, and how this varies between the sexes. Using innovative approaches that we have developed, coupled with powerful experimental models provides us with unparalleled opportunity to expand our understanding of basic muscle biology, aging and sex similarities/differences. We anticipate that a better understanding of the genetic programs required for muscle growth at different stages of life will enable future development of products and practices that can promote healthy early development and aging of humans and companion animals. These insights could also be leveraged to benefit the livestock/fishery industries that contribute to Australia's food supplies, local industry, and export economies. We will work with our University's Communications Team to engage the wider community through digital and other media to promote awareness of our findings and the public-access data we will generate.												
DP240100450 Talei, A/Prof Mohsen	**Towards highly-efficient hydrogen gas turbines** The increasing interest in green hydrogen has led to a need for research and development in combustion systems that can accommodate hydrogen. One promising technology is low-emission gas turbines, which is a key player in the electricity market. However, hydrogen gas turbines are susceptible to a phenomenon called thermoacoustic instability, causing loud noise and can damage equipment. This project represents the first comprehensive study of the effects of hydrogen fuel on thermoacoustic instability under conditions relevant to gas turbines. By examining low-order models, commonly used for designing gas turbines, this project can significantly advance the field and facilitate the adoption of green hydrogen as a fuel source.	84,018.50	170,467.00	170,547.00	84,098.50	0.00	0.00	509,131.00			France		
	National Interest Test Statement The use of hydrogen as an energy source will play an important role in transitioning Australia into a green economy. Australia has abundant renewable energy available to produce hydrogen using electrolysis and other methods. Technologically, the easiest transition to renewables is when renewables can replace fossil fuels. Hydrogen can be used as a fuel in gas turbines, however, its combustion can become unstable under certain conditions. This project will reveal the physical processes responsible for combustion instability and develop new predictive tools to design hydrogen gas turbines with stable combustion. Translation and potential commercialisation of the results will be accelerated through demonstrations to relevant industry and government networks. As gas turbines are crucial for the stability of the energy grid using intermittent renewable energy sources, this project will help progress Australia's transition to carbon-free electricity. Thus, the environmental benefits of this research are clear. Also, the results of this project will have economic benefits by reducing the cost of green electricity. Finally, this project will support the international export of Hydrogen technology and thus will advance Australia's position as a major player in the global hydrogen industry.												
DP240100815	**Decoding microtubule remodelling in sperm production** All eukaryotic cells possess a dynamic microtubule (MT)	115,971.50	225,296.50	221,993.50	112,668.50	0.00	0.00	675,930.00			France		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
O'Bryan, Prof Moira K	cytoskeleton, which requires constant remodelling to satisfy its many essential cellular roles. Emerging data suggests modifications to the MT surface (the tubulin code) may act as instructional signposts for remodelling. This project aims to define a fundamental component of the tubulin code, glutamylation, and define how this directs MT severing. It also aims to define the cellular functions of MT-severing enzyme FIGNL1 and key MT glutamylation enzymes (CCP1, CCP5 and TTLL1). Insights will be generated using sperm production as a model system and will thus inform the mechanisms by which fertile sperm are built, in addition to being relevant to cell biology across eukaryotic species. **National Interest Test Statement** All eukaryotic cells possess a dynamic 'skeleton' of microtubules which is constantly remodelled to allow cells to function. Microtubule severing is a key driver of this remodelling, and its dysfunction leads to disease and lost productivity across species. How microtubule severing proteins know when and where to cut remains mysterious. Emerging data, however, suggests modifications to the microtubule surface, collectively known as the 'tubulin code', may act as instructional signposts. This project aims to define, a key aspect of the tubulin code, glutamylation, and how it interfaces with microtubule severing during mammalian sperm production. This research will benefit Australia through knowledge generation, including insights relevant to male fertility in agricultural species. Equally, it will inform the understanding of cell function across eukaryotes, with particular relevance to mammals. With time this may inform selection of high fertility stud animals in agriculture, in addition to biotechnology protocols and drug development, which will have economical and commercial benefits to the Australian community. Indeed, microtubule biology has previously been relevant to diverse applications including herbicides, fungicides and cancer therapies. Such opportunities will be explored through partnerships with agriculture and biotechnology industries, and research impact will be accelerated across the reproductive and cell biology sciences through publications and conferences.												
DP240100938 Tan, Prof Ying	**Human-Robot Co-Evolution: Achieving the full potential of future workplaces** Physical human-robot systems are widely used to amplify the capability of human labourers and improve ergonomics in the workplace. This project aims to develop robot controllers that shape the co-evolution of these systems. Through physical human-robot interaction studies it will generate new knowledge of how humans adapt to working with robots, which will then be incorporated into the robot controller design. Expected outcomes include a better understanding of human adaptation and a systematic approach to shaping human-robot interaction over time. This should provide significant benefits across different skill and labour-intensive industries in Australia, such as improved worker productivity and safer human-robot collaboration. **National Interest Test Statement** Increasingly, robots are being used to work together with people to improve efficiency in everyday life or industry. However, when a human and robot physically interact, they each adapt their behaviour to account for the other. When successful this improves safety and efficiency, yet, if the robot does not consider the team dynamics human-robot interaction can also lead to unsafe behaviours and user confusion. This project will design smart robotic assistance to improve human-robot team performance. It will do so by incorporating a greater understanding of how humans adapt to robot to technology. The results will be conveyed to industry through workshops and demonstration seminars. Also, we will investigate the potential for its use as a training tool for new collaborations with our industry partners. As robotic technology is used in many sectors within Australia, improving human-robot collaboration has commercial, economic, environmental and social benefits. Industries, such as manufacturing, logistics and consumer service will become more efficient, productive and safe. Improved productivity by increasing team capability will reduce costs and remedy labour shortages, especially in remote areas. Also, smart robotic assistance will improve workplace safety and reduce injuries.	81,651.00	168,182.00	172,951.50	86,420.50	0.00	0.00	509,205.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240100942 Martin, Prof Andrew M	**If a spin could torque: quantum force sensing with levitated nanodiamonds** This project aims to detect the tiny twisting forces imparted by a single quantum spin on a host diamond nanocrystal levitating in vacuum. Our team will build both a hypersensitive detector of quantum rotations and the complex theoretical models for quantum spin systems coupled to the mechanical motion of nanometre-sized diamonds. The expected experimental capabilities and knowledge generated by this project will enable world-first measurements of quantum effects with unparalleled sensitivity and powerful new quantum sensing paradigms. The project should enable significant benefits, such as incisive tests of the limits of quantum theory and new Australian technology operating at the interface of the quantum and classical worlds.	81,326.00	173,877.00	173,833.00	81,282.00	0.00	0.00	510,318.00			Germany, France, Austria, Switzerland		
	National Interest Test Statement This project aims to make the first measurement of an effect never before seen: a tiny twist imparted on a classical body by a single quantum object. Outcomes include the development of technology with unprecedented sensitivity to tiny rotations, and new knowledge of the fundamental limitations of quantum theory. The project will directly benefit Australia by delivering quantum-powered technology with disruptive economic and commercial potential for precision sensing of forces and rotations. Many crucial applications in aerospace, resource prospecting and defence stand to benefit from our innovations. The project will leverage existing technology translation pathways to maximise the likelihood of benefits, whereby new technologies harnessing fundamental quantum properties are moving from the research lab into industry. To enhance the already considerable public interest in quantum research we will continue to make our research accessible through social media (e.g. Twitter) and by writing for a non-scientific audience in publications such as The Conversation.												
DP240100979 Little, A/Prof Daniel R	**Human Scheduling of Perceptual Tasks** This project aims to develop a novel approach for synthesising how people prioritise information with theories of attention and decision making. Characterising inefficient scheduling in the tradeoff between the difficulty and the cost/benefit of different subtasks will allow the development of a formal computional model that generalises statistical models of rank order data to a theory of the timing of scheduling decisions and task completions. Outcomes include benchmark data from a novel paradigm for studying perceptual decisions and behavior and a model which can explain and predict human scheduling. This project aims to benefit industry by allowing for the simulation of information prioritisation by human agents in complex environments.	41,972.50	95,048.50	106,056.50	52,980.50	0.00	0.00	296,058.00			United States of America		
	National Interest Test Statement Information overload is estimated to cost the Australian economy and population well-being via lack of engagement, reduced sales, stress, anxiety, burnout, and inefficiency. In this project, we aim to study, through a series of psychological experiments, how people prioritise the completion and processing of a set of tasks. Real-time information prioritisation is critical in the context of many industries of national importance including air traffic control, rail operations, manufacturing as well as any industry that involves working with unmanned vehicles and autonomous agents. At present, little is known about how people prioritise multiple sources of information, but we can use insights from engineering and computer science to set a benchmark on how people should optimally prioritise tasks. Understanding how people prioritise information through the research in our proposal warrants our team the potential to develop strategies to significantly alleviate overload. Development of a model of information prioritisation has considerable practical value, allowing for the simulation of human behaviour across domains relevant to Australian industry. We anticipate communicating our results through public media outlets and through our industry networks in defense and engineering. We will additionally use our interdisciplinary networks with links to industry to ensure that our work												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	benefits and informs the future development of human-centred control systems and interface design.												
DP240101006 Qi, Dr Jianzhong	**Empowering Next-Generation Spatial Digital Twins with Linked Spatial Data** This project aims to design novel algorithms for aligning and querying of spatial data from heterogeneous sources. Spatial data is being generated at an unprecedented rate due to the prevalence of mobile devices and ubiquitous connectivity, which enables a novel application, spatial digital twins. However, harnessing this data in spatial digital twins is hampered by the isolation of data from different sources. The project will investigate algorithms to align and query spatial data from heterogeneous sources for high accessibility. It will enable novel applications with advanced spatial analytical querying needs, such as emergency planning, benefiting location-based service providers, urban planners, and emergency management agencies.	72,190.00	143,828.50	144,845.00	73,206.50	0.00	0.00	434,070.00			Hong Kong (SAR of China), Germany		
	National Interest Test Statement Sensors and mobile devices provide an increasing amount of information to generate spatial datasets, such as maps or disaster information. An important emerging tool for management is a spatial digital twin, a digital version of a geographic entity, such as a city. A spatial digital twin uses this data to let managers visually inspect the status of the city and run simulations to study impact of development or emergency response plans. Yet, information about entities from different data sources is disconnected limiting the modelling capability of existing spatial digital twins. This project will develop algorithms to effectively search and model spatial entities from different sources. Our results can inform decision-makers, managers of transport, emergency and disaster, and urban planners. The project results will be conveyed to government and organisations through demonstrations and media. An Australian digital twin has commercial, economic, environmental and social benefits. It will provide excellent business opportunities and enormous cost savings for location-based services. It can optimise decision-making nationally for transport systems, bushfire and pandemic risk management. Improvements in planning and responding to disasters through a national lens will protect properties and livelihoods as well as save lives.												
DP240101009 Ando, Prof Tomohiro	**Macroeconomic and Financial Modelling in an Era of Extremes** This project aims to develop methods to allow workhorse models in economics and finance to better reflect tail events--low probability extreme events, such as the Global Financial Crisis and the COVID-19 pandemic. It intends to address fundamental technical challenges in the estimation of such models, develop a coherent framework for counterfactual analysis of these models and propose methods to apply these models in a big-data environment. Expected outcomes include new insights into the transmission of tail risks in the global economic and financial system. This should provide significant benefits, including guidance to Australian and international policymakers charged with maintaining stability in the face of extreme events.	44,194.00	122,966.50	128,589.00	49,816.50	0.00	0.00	345,566.00			England		
	National Interest Test Statement Between the mid-1980s and the mid-2000s, the Australian economy and many others enjoyed a period of tranquillity known as the Great Moderation. Over this period, models of the ordinary behaviour of the economy proved successful. However, we have since lived through a sequence of extraordinary events, such as the Global Financial Crisis and the COVID pandemic. Models of the ordinary functioning of the economy are inadequate when faced with												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	such extreme events, leaving gaps in policymakers' understanding of economic systems in crisis states, when the need for rapid and effective policy interventions is greatest. By developing methods that allow workhorse models in economics and finance to speak to key issues in the transmission and impact of extreme events, this project will equip policymakers and practitioners with an enriched understanding of the behaviour of economic and financial systems in times of extreme stress. This will allow for more agile and better optimised policymaking when the next crisis comes, helping policymakers to better maintain economic stability, deliver better outcomes for ordinary Australians and potentially save taxpayer money. Proposed workshops, masterclasses, web resources and the working paper series featured in the project's dissemination plan will promote uptake of these modelling breakthroughs by researchers, policymakers and practitioners.											
DP240101064 Wong, Prof Elaine	**Resilient Remote Environment Emulation for Human-to-Machine Communication** Human-to-machine haptic communication allow humans to immersively interact with remotely-located robots/machines. Current networks cannot support its technical demands, thereby limiting the achievable human-machine distance. This project aims to develop cloudlet intelligence together with a programmable resilient network to realise reliable remote environment emulation, a concept where the physical environment at the remote machine is emulated close to the human. A key outcome will be the first reliable remote environment emulation platform that achieves vast human-machine distances on current networks. Enabling immersive human-machine experience will significantly benefit many sectors, from education through to industrial manufacturing.	83,168.50	177,267.00	190,627.50	96,529.00	0.00	0.00	547,592.00			Sweden, Germany, Canada		
	National Interest Test Statement Human-to-machine haptic applications allow humans to immersively interact with remote environments through feeling and controlling real and virtual machines/robots. These emerging applications are in high demand, especially in remote Australia. Yet, the achievable human-machine distance is severely limited because current optical networks cannot support the stringent demands of these applications, such as reliability and latency, or delays. This project will develop new technological capabilities to provide resilient solutions for current optical networks. It will make advances that allow human control of haptic machines in real-time over long distances. We will use traditional academic outputs, white papers, and presentations to empower practitioners, and engage with standardisation groups to help shape policy and guidelines. Also, we will harness our international collaborations to boost Australia's research capability and reputation, and to share our knowledge with world-leading research groups. Providing human-to-machine applications will bring about significant and widespread benefit to Australia across many sectors. For example, boosting the return-on-investment of currently deployed networks are economic benefits, enabling immersive and accessible education provides social benefits, reducing carbon emissions from transportation and logistics are environmental benefits, and increasing productivity of industrial manufacturing are commercial benefits.											
DP240101109 Cropley, A/Prof Vanessa L	**The impact of circadian and sleep factors on neurodevelopment** This project aims to longitudinally examine the contributions of multiple circadian and sleep factors on the development of the teen brain. Adolescence is associated with a change in the internal body clock, leading to later bed and wake times and loss of sleep. It is also a time when the teenage brain is rapidly maturing to support learning. Despite the known importance of sleep in adolescence we know little about how the circadian clock and sleep impacts the developing brain. Our project expects to advance understanding of the importance of sleep and circadian timing for healthy brain and cognitive development. This knowledge will inform policy and prevention/intervention	82,773.50	143,189.50	130,504.50	127,707.00	85,084.00	27,465.50	596,724.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	programs to benefit individuals, parents and the community. **National Interest Test Statement** Sleep patterns substantially change during adolescence, a time when the teenage brain is rapidly maturing to support learning and cognition. Teenagers experience a biological delay to their internal circadian clock, causing them to go to bed later. This can lead to insufficient and/or irregular sleep for many Australian teens, which in turn may impact their engagement and effective learning at school. However, how these changes to sleep patterns impacts brain development remains unclear. This project will investigate longitudinal relationships between multiple facets of sleep-wakefulness and changes in brain structure over early to late adolescence using brain imaging and detailed sleep pattern assessment. Using sophisticated computational methods, we will identify sleep and circadian markers that are linked to specific facets of brain development, and whether these relationships in turn predict academic performance. This project will contribute to a better understanding of the drivers of adolescent brain development and learning outcomes. Findings will provide education and policy makers with new knowledge regarding the importance of sleep for healthy brain development and inform intervention programs that support young people to learn effectively during this important time in their development. Outcomes will be shared via the media, outreach to stakeholder organisations (e.g. Sleep Health Foundation) and dissemination to the public via fact sheets and forums.												
DP240101173 Corbett, A/Prof Alexandra J	**How do unconventional T cells die?** Mammalian cells die via several different mechanisms, each of which is tightly controlled at a molecular level. The choice of death pathway depends on the trigger and cell type. This project will investigate the mechanisms controlling death of T cells, including conventional T cells, and unconventional T cells, such as mucosal-associated invariant T (MAIT) cells, in normal conditions and during inflammation. It combines methods we developed to study MAIT cells in vivo with expertise in cell death analysis. This project is expected to elucidate the complex mechanisms controlling T cell survival/death and increase our fundamental understanding of cell death mechanisms of activated T cells.	107,829.00	216,301.00	216,620.00	108,148.00	0.00	0.00	648,898.00			United States of America		
	National Interest Test Statement Cell death is a complex and highly regulated process. Our body's immune response to infection or damage relies on this process to regulate numbers of specific immune cell populations. We will address an important knowledge gap by defining the molecular processes that control the life and death of different types of T cells – an essential part of our immune system. This knowledge is important as T cell population expansion and contraction is vital to generate optimal immune responses. This innovative project will combine immunology and molecular and cell biology fields to expand our understanding of the immune system, which may create future opportunities to develop technologies to manipulate immune responses. Based on our current research trajectory, this project will result in high-impact publications that we will promote via media releases and social media. As our research will advance our understanding of T cell biology, it will attract invitations to present at local and international conferences. Outcomes from this research may also deliver commercial benefits to Australia's biotechnology sector that routinely use live immune cells. This project will strengthen Australia's research capacity by developing our expertise in molecular immunology and supporting the training of higher degree research students, thus building foundations for future immunological research programs.												
DP240101264 Osth, Dr Adam F	**Using cognitive models to understand memorability of real world images** This proposal aims to understand and make predictions about which real world images -- specifically living things, objects, and human faces -- that people will remember remember via an integration of cognitive models of memory and machine learning techniques. Computer vision models and similarity scaling techniques will be used to produce psychological representations of the images. These representations will then be integrated with cognitive models of memory, which predict that images are more	103,682.00	210,544.00	134,664.50	82,945.50	55,143.00	0.00	586,979.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	likely to be recognized if they are similar to each of the representations in memory. Large scale memory and similarity rating datasets will be used to develop and test the model. **National Interest Test Statement** The relationship between what we see and how we remember is important in everyday life. Existing research has found that some images are consistently well remembered while others are rarely remembered. The purpose of this proposal is to develop a model that can be used to understand why some images of objects, living things, and human faces are more memorable than others, which can be used to make predictions about what images people will remember or forget. We will use computer vision techniques to develop a cognitive model that predicts that images are more likely to be remembered if they are more similar to other learned images or if they possess more distinctive features. The model will improve our understanding of what makes an image memorable but it can also be used to predict which images will be best remembered and the extent to which an image's memorability depends on images that accompany it. This research could benefit advertisers attempting to construct memorable images, educators interested in producing memorable materials, or eyewitness memory practitioners who evaluate whether witnesses remember seeing a particular culprit. Research will be published in open access format and both data and model code will be publicly shared.												
DP240101309 Crozier, Prof Kenneth B	**Mid-infrared quantum dots for room temperature photodetectors and emitters** This project aims to develop new technologies for mid-wave infrared (MWIR) cameras based on quantum dots (QDs). These will include MWIR photodetectors based on QD-sensitised photodetectors and MWIR emitters based on QD electroluminescence devices. This project expects to generate new knowledge in MWIR QDs and in devices that sense and emit infrared light. Expected outcomes of the project include MWIR cameras that are smaller, lighter, lower in power consumption and cheaper than existing technologies. This project is expected to provide significant benefits, such as dramatic reductions in the cost of infrared cameras and sensors. The high cost of infrared cameras currently limits their use in Australia largely to defence.	92,449.00	185,636.00	188,804.50	95,617.50	0.00	0.00	562,507.00			Germany, United States of America		
	National Interest Test Statement This project aims to develop new technologies for infrared cameras based on quantum dots, which are particles with diameters 10000 times smaller than a human hair. It will develop new types of quantum dots, and incorporate them into devices that sense and emit infrared light. Existing technologies for infrared cameras are based on toxic materials, require cooling for good performance, and result in cameras that are large, heavy, power-hungry and of high cost. Quantum dots could enable infrared cameras that are smaller, lighter, lower in power consumption and cheaper. The proposed research will provide commercial benefit to Australians by dramatic reductions in the cost of infrared cameras and sensors. The high cost of infrared cameras currently limits their use in Australia to defence and selected government agencies. Reductions in cost would make infrared cameras available to others. Rural firefighters could benefit from being able to see through smoke. Search and rescue operations could benefit from being able see over long distances through fog. Farmers could benefit from images of crop fields that quantitatively reveal otherwise-hidden properties such as water uptake and plant health. The research will produce new patents, which we will seek to license to Australian industry, enabling commercial translation. We will publicise our work by seeking coverage in the popular press.												
DP240101332 Stojanovski, A/Prof Diana	**Manipulation of mitochondrial function by Legionella pneumophila.** The intracellular bacterial pathogen Legionella pneumophila co-evolved with eukaryotic hosts and has developed sophisticated mechanisms to manipulate human cell function – mitochondria in particular – by secreting >300 effector proteins through a specialised Type-IV system into the host cell. This research aims to understand the function	101,611.00	205,712.00	208,832.50	104,731.50	0.00	0.00	620,887.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	of effector proteins targeted to mitochondria; delivering important new knowledge in host-pathogen and mitochondrial biology and advanced cell biology tools. With most of the effector proteins yet to be characterised, benefits from the project will be to reveal specifically how these target mitochondria, and more broadly, how bacterial pathogens manipulate organelles for their survival.												
	National Interest Test Statement												
	Legionnaires disease, a severe form of pneumonia, is caused by the bacterium Legionella pneumophila. Legionella replicate inside human cells by introducing a wide range of proteins (over 300 'effector proteins') into the cell. Effector proteins hijack the cells: overriding normal cell functions and causing disease. Research suggests that certain Legionella effector proteins target mitochondria. Mitochondria are complex, dynamic cell components affecting many key functions, including energy production. Effector proteins from other pathogens target mitochondria, but we don't know which biochemical pathways Legionella is targeting. This study will investigate how Legionella effector proteins target mitochondria and manipulate mitochondrial functions. As all but the simplest forms of life have mitochondria, the resulting understanding of mitochondrial biology will have broad scientific application. The results will improve our understanding of bacterial and mitochondrial biology and pathogen–host interactions. In the long term, this could lead to new therapies or methods to combat Legionella and other pathogens. Trainee scientists in the project will gain technical skills in high demand in research and other disciplines, enhancing Australian research capability and contributing to community wellbeing and a strong economy. This research will be shared in public outreach including articles, news media and social media and will be presented at relevant conferences.												
DP240101405 Kentish, Prof Sandra E	**A unifying model for ion exchange membranes – towards a low carbon future** Polymeric ion exchange membranes are key to emerging renewable energy systems and bioprocessing applications. Advances in this field are currently impeded by a focus on their performance in idealised pure solutions and siloed research. This project aims to draw together fundamental and applied research to develop an innovative, unifying model for the transport of both charged ions and uncharged molecules through these membranes within complex, multicomponent mixtures. The team will build on strong collaborations to drive uptake of the new model within the clean energy and CO2 reduction sectors to advance the abatement of Australian emissions; and will prepare young researchers for a role within these emerging fields.	58,639.00	160,115.00	198,092.50	143,251.00	46,634.50	0.00	606,732.00			Scotland, United States of America, Denmark		
	National Interest Test Statement												
	A low emission future for Australia will require the use of a range of electrochemical devices. These include the electrolysers used for hydrogen production, the fuel cells used for electrical energy generation and the batteries used for energy storage. Electrochemical reactors will transform carbon dioxide into chemicals. Fermentation will be used to convert biomass into solvents, chemicals and pharmaceuticals with electrodialysis used downstream of these reactors to purify the products. All of these systems use polymeric ion-exchange membranes that are not well understood. This project will combine experimental information on membrane performance and new mathematical models into computer programs that can be used by both Australian researchers and industry. The research results and computer programs will be made broadly available through the research team's extensive industrial networks, particularly in the fields of pharmaceutical, renewable fuel and dairy product manufacture. Commercial and economic benefits will flow to the Australian industries that adopt project results by improving system designs and optimizing operating protocols. Companies will have higher productivity through improved efficiencies. Costs will be reduced through improved decisions and better usage of membranes. Importantly, the Australia environment will benefit from reduced carbon emissions through greater use of renewable energy and biomass.												
DP240101511 Smith, Prof Philip L	**A statistical decision theory of cognitive capacity** This project aims to investigate the limited capacity of the human cognitive system to form representations of the things in the world around us and to make decisions about	89,276.00	185,531.00	112,777.50	16,522.50	0.00	0.00	404,107.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	them in real time. Its goal is to provide an integrated theory of cognitive capacity based on the statistical properties of cognitive representations and the decision processes that act on them. Its expected outcome will be a unified metric for cognitive capacity that will allow us to quantify how cognitive load affects the speed and accuracy of decision making. It will benefit the design and evaluation of high workload real-time decision systems and will contribute to the selection and training of users of such systems.												
	National Interest Test Statement A brightly-illuminated digital billboard changes abruptly as you pass it. It is distracting but is it dangerous? Digital billboards are one facet of a modern “attention economy” aimed at capturing and exploiting attention, whose architects understand that human cognitive capacity – that is, the attention, memory, and decision-making processes that form mental representations of events in the world and translate perception into action – is a limited resource that can be exploited economically. More generally, people must interact with complex designed systems that place demands on their cognitive capacity and in which information overload can lead to decision errors that may have serious consequences. At present we have no general metric to measure and predict the cognitive demands of the environments in which we place people. The aim of this project is to develop a unified theory of cognitive capacity that can mathematically predict the speed and accuracy of decision making as a function of the nature, number, and complexity of the events to which people must attend and respond. The project will be of benefit to those involved in the design and evaluation of systems and to policy makers and safety experts responsible for the legislation surrounding their use. We will communicate our results through media and via our interdisciplinary links with engineers and real-time system designers.												
DP240101588 Hogan, Prof Benjamin M	**Hippo signalling control of transcription in lymphatic vascular development** Lymphatic vasculature forms complex, branched networks present in almost all vertebrate tissues and organs. Signalling in lymphatic endothelial cells determines the fate, structure and function of these complex and essential networks. This project follows our recent discovery of a major role for the Hippo signalling pathway in lymphatic vascular development. It aims to investigate how Hippo signalling regulates essential target genes that drive lymphatic development. The project expects to generate fundamental knowledge in vascular signalling, transcription and the control of vascular network growth and expansion. Outcomes may provide significant benefits in new approaches in stem cell biology, tissue engineering and regenerative biology.	165,566.50	341,154.00	355,589.00	180,001.50	0.00	0.00	1,042,311.00			Sweden, Japan, England		
	National Interest Test Statement In vertebrate animals, a network of lymphatic vessels (thin walled, bloodless vasculature) underpins healthy tissue growth and function. We know these vessels play several key roles in normal tissue function and inflammation. However, there are fundamental gaps in our understanding of the specific underlying processes that control lymphatic vessel formation and function. This project will expand knowledge in a new area of cellular signalling in the control of lymphatic vessel formation, growth and function. Unlocking new knowledge in the control of lymphatic vessel formation and function has potential to lead to new innovations in organ and tissue engineering, tissue repair and regenerative biology. In the future, this work may generate innovative approaches in biotechnology and pharmaceuticals. Longer-term outcomes may help people keep working and participating in social activities as they age through new tissue repair and future biotechnology applications. The project will build cutting-edge research capacity in Australia through training scientists in world-class molecular and cellular biology of vasculature and vascular signalling. We will promote our findings through publication in journals with suitable open access policies, presentations at leading international conferences, press releases and through social media.												
DP240101665	**Understanding T cell trafficking and function during antigenic interference**	114,982.00	263,287.50	281,129.50	132,824.00	0.00	0.00	792,223.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Kedzierska, Prof Katherine	Science generally studies antigenic stimulation in isolation, by measuring immunity towards antigens derived from a single pathogen. However, as mammals can harbour more than one infection at any given time, we established a model of antigenic interference using different antigens derived from two unrelated pathogens, influenza A (IAV) and Semliki Forest virus (SFV). Our data show that prior exposure to either IAV or SFV greatly perturbs T cell dynamics. This proposal will study, at cellular and molecular levels, T cell trafficking, function and clonal distribution during antigenic interference, thus advance fundamental knowledge on T cell immunity during antigenic competition, and provide a new paradigm on how we research T cell immunity. **National Interest Test Statement** T cells are the body's fighter planes that protect humans and animals from infection and tumours by taking down the invaders (pathogenic viruses). To date, the activation and function of T cells has only been studied in the context of a single invader but the reality is that mammals can harbour more than one infection at any given time, perhaps in sequence or concurrently. Our current understanding of how T cells cope with multiple invaders is limited. This project will study activation and function of T cells when exposed simultaneously to two unrelated invaders. This proposal will develop new knowledge on how the body's fighter planes are activated, transported, primed for attack and stored for rapid response to future invasions. Some of the long term benefits include commercial development of new human and animal vaccines and rational design of novel regimens for T cell immunotherapies, relevant for infectious diseases, cancers and future pandemic threats. This project will provide training in cutting-edge techniques to study the immune system for the next generation to ensure Australia remains the leading country in the field of the national priority, Health. Outcomes from this project will be communicated to the general public via news-articles, public lectures and social media channels.												
DP240101674 Smith, A/Prof Kelly A	**The impact of Hyaluronic Acid on growth factor signalling and angiogenesis** Blood vessel development is controlled by growth factor signalling. Vessels are attracted by and migrate along growth factor gradients, and this is controlled by the extracellular matrix (ECM). From the zebrafish model, we have identified a novel gene that modulates the ECM, impacting growth factor signalling and vessel development. The project will explore by what mechanism this gene impacts signalling. It will comprehensively define where in the embryo it is required and investigate what cofactors it interacts with to perform its function. Using genetic zebrafish and mouse models as well as cell culture models we will investigate the fundamental biology of this gene. **National Interest Test Statement** Animals need a blood supply for nutrient and waste exchange to both develop and support life. This need is met by a network of blood vessels throughout the body. Vessels form via sprouting and growth prompted by proteins called growth factors. Growth factors signal to blood vessels, instructing them to multiply and remodel to form new vessels. Growth factors are incredibly potent in stimulating vessel growth and, as such, there are accessory proteins to modulate their potency, ensuring vessels grow in the right place at the right time. The project focuses on a newly identified modulator of growth factor potency that has been shown to be essential for blood vessels to form correctly. We currently don't understand how it functions so are restricted in our ability to use this molecule to promote vessel growth for the improvement of health and well-being, and potentially the growth of livestock. The project will generate new knowledge about how this modulator functions. It will employ and train Australian researchers in highly skilled and specialised research, improving human capital and these individuals' ability to secure high-paid jobs in academia, industry, and the health sector. We anticipate new intellectual property may also be generated by this research. Outcomes from this work will be published in open access international journals, reported in press releases, promoted on social media and presented at both national & international conferences.	88,372.00	183,571.00	196,973.00	101,774.00	0.00	0.00	570,690.00			United States of America		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240101743 Hutchins, Prof Nicholas	**An adaptive surface for improved modelling of rough wall bounded turbulence** This project aims to improve the prediction of drag where fluid flows over rough surfaces. This is a significant problem, with the uncertainty in drag penalty prediction for shipping alone exceeding ten billion dollars annually. The societal importance of these flows demands action, yet novel approaches must be sought to efficiently explore the wide range of roughness types encountered in practice. An adaptive surface is proposed, where a roughness configuration can be dialled in at the press of a button, to rapidly converge on improved models. A key outcome of this project will be improved predictive models of drag for rough wall flows. Benefits will include improved efficiencies and reduced emissions across a wide range of industries.	111,651.00	208,444.50	117,028.50	20,235.00	0.00	0.00	457,359.00			England		
	National Interest Test Statement The flow of air or water over rough surfaces occurs in many processes, both natural and man-made. Examples are fouled ship hulls, transport of water or gas through pipes, and the atmosphere flowing over complex terrain. These processes profoundly influence Australian lives, dictating the energy efficiency of engineering systems, and affecting the accuracy of weather and climate models. Despite this prevalence, and over a century of effort, our ability to predict these flows is far from complete. This is due to the vast range of rough surfaces and coverages involved (from sparse patches of barnacles on ship hulls, all the way to crops and forests in atmospheric flows). Currently available data cover only a small range of these scenarios and many questions remain unanswered. To redress this issue, we will build a novel tool (a computer-controlled, adaptive surface) that will allow us to rapidly test an unprecedented range of relevant surfaces. We will communicate our findings to our peers and through our networks of industry partners and regulatory bodies. This step change in our ability to predict these flows will have far-reaching benefits for Australia. Improved efficiencies in engineering systems will reduce emissions and save energy, costs and time. Society will gain from better-informed regulations, for example on ship fouling, with environmental benefits. Refined models of atmospheric and oceanographic flows will enable improved weather and climate forecasts.												
DP240101787 de Gier, Prof Jan	**Shuffle algebras and vertex models** Shuffle algebras are important new mathematical structures that offer a new approaches and techniques to solve outstanding open problems in a variety of branches of mathematics, including mathematical physics, algebraic geometry and combinatorics. This project proposes to find solutions to key open problems using connections between shuffle algebras and integrable lattice models. The expected outcomes include (i) a new framework of shuffle algebra techniques to solve challenging research problems in mathematical physics and statistical mechanics, (ii) practical and computationally feasible constructions of shuffle algebras using vertex models, (iii) solutions to unresolved spectral problems of open quantum systems.	82,918.50	173,367.00	147,780.50	57,332.00	0.00	0.00	461,398.00			Japan, United States of America		
	National Interest Test Statement The development of new, advanced mathematical techniques provides the modern toolkit that is essential to progress much innovation in science and engineering. This project focuses on a type of newly discovered mathematical structure, called shuffle algebra, that can be used to analyse models in quantum mechanics and statistical physics. The further development and deeper understanding of these structures will help to address complex research challenges in physics, engineering and computer science. Solving those challenges will provide important long-term commercial and economic benefits for Australia, informing new advances in quantum computing, complex engineering and material science that can be utilised by Australian business, industry and finance. The project will also help train a mathematically sophisticated workforce, prized by the finance, resources, information technology and manufacturing industries, with economic and social benefits for Australia. The mathematical tools and findings developed in the project will be made freely available to a wide industrial, computing and academic network, so that these techniques can												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	be used to explore many different applications.												
DP240101821 Hu, Dr Hangwei	**Predatory protists: natural weapons for soil-borne pathogen control** This project aims to understand the mechanistic interactions of predatory protists and fungal pathogens and develop innovative biotechnologies using the protists to suppress soil-borne pathogens. By directly preying on fungal pathogens or activating plant-beneficial bacteria to combat them, the soil predatory protists will be identified, cultivated and utilised to improve disease management. Expected outcomes of this project will include a mechanistic understanding of the contribution of protists to pathogen suppression and an innovative, protist-based disease management tool. The novel technologies developed in this project have potentials to benefit Australian agriculture and land management.	79,696.00	166,538.50	176,946.50	90,104.00	0.00	0.00	513,285.00			Netherlands		
	National Interest Test Statement Soil-borne fungal pathogens represent a significant threat to global agricultural production and food security, and are projected to increasingly impact crop yields under future climatic scenarios. This project aims to address a significant knowledge gap in the use of predatory protists, which are major predators of soil microbes, to effectively control soil-borne fungal pathogens. The project will generate new knowledge about the major functional groups of protists that can suppress soil-borne pathogens, and develop high-throughput methods for cultivating plant-beneficial protists and creating synthetic protist communities to enhance disease suppression. The use of predatory protists as a disease management tool has the potential to reduce dependence on chemical fungicides and improve the economic viability of Australian agriculture. The outcomes of this project thus will have significant economic and environmental benefits to the Australian community. This project will also contribute to enhancing Australia's international reputation as a leader in sustainable agriculture practices. This framework developed in this project will serve as a model for developing agricultural biotechnology tools that are based on trophic control within microbial food webs, and can drive sustainable agriculture to feed our rapidly growing population.												
DP240101831 Walker, Dr Leigh C	**Midbrain hunger signalling modifies decision making under conflict** Decision-making is one of the most important and fundamental biological processes executed by the mammalian brain. Environmental threats and physiological pressures, such as hunger, can influence decision-making processes skewing the risk/reward ratio, yet how the brain integrates these conflicting goals to determine action selection is unknown. This project aims to investigate brain chemistry and circuitry controlling decision making under conflict using a multidisciplinary approach combining behaviour, pharmacogenetics, and sophisticated molecular and functional profiling. The expected outcomes will advance theories regarding the neural organisation and computation of decision making under conflict.	115,274.50	195,936.50	118,151.50	37,489.50	0.00	0.00	466,852.00			United States of America		
	National Interest Test Statement Everyday decision making is often accompanied by conflict - whether we make the most appropriate decision or not can be influenced by both internal and external factors. This project aims to understand how the brain integrates signals from the external environment and internal signals from within the body, such as hunger, to make decisions when conflicted. Using innovative methods, we will characterise and alter activity of the brain to gain insight into how this information is incorporated in mice. This knowledge is critical for many industries in Australia, with the potential to inform primary food production industries (agriculture, fisheries), which could lead to improved growth rates, health &												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	well-being, and survival of animals; ultimately enhancing economic outcomes. Further, such new knowledge may influence advertising (how hunger status guides purchasing decisions) and education (optimal environments to facilitate learning) with our findings shared broadly through media, social media and community engagement. This research will make important contributions to our fundamental understanding of how the brain computes risk/reward decisions in different environmental conditions, while training the next generation of scientists in state-of-the-art neuroscience techniques. Long-term it may also have implications for the health and pharmaceutical industries, laying the foundation for new treatments for neuropsychiatric disorders characterised by impaired decision making.												
DP240101834 Williams, Dr Kate	**National research impact policies: Uncovering the 'value' in evaluation** This project aims to identify the conceptions of value that underpin national research impact policies and to examine the consequences for research activities, outputs, and outcomes. By studying four countries with different national policy approaches to research impact, it is expected that significant new knowledge about the role of research in society will be produced. Expected outcomes include a framework that links markers of value (i.e. what counts as valuable research) to research policy and assessment principles. Expected benefits include policy learnings to improve how research is evaluated in Australia, thereby enhancing the alignment between what is valued by those who fund research, those who produce it, and those who use it.	30,633.00	76,714.00	96,755.00	81,528.50	30,854.50	0.00	316,485.00			England, Germany, South Africa		
	National Interest Test Statement The Australian government makes a significant investment in research, science and innovation ($11.8b in 2021-22). This investment is meant to empower Australia to be globally competitive as a knowledge economy. Australia's research system is highly productive, ranked tenth globally in citations. However, its capacity to translate research into outcomes that benefit Australian society and the wider world is less demonstrated. This project investigates four countries with distinct policies on the societal benefit of research – Australia, the United Kingdom, Germany and South Africa. It will generate knowledge on the nature and effects of these policies and their implementation. Through strategic engagement with the Research Excellence Branch of the Australian Research Council and other stakeholders, this project's findings will be used, via stakeholder forums, roundtables and targeted reports, to inform research policy and assessment practice. This project will provide value to the Australian government, research policymakers, and the research sector by analysing and developing new strategies on translating research into societal benefit. This will help: the government (via evidence on return on research investment), research policymakers (via evidence on planning, monitoring and evaluating societal benefit), researchers and administrators (via strategies for creating, reporting and promoting wider benefit) and the public (via clarity on the value of research for society).												
DP240101873 Perfors, Prof Andrew F	**Bridging the meaning gap: A computational approach to semantic variation** This project aims to create and validate a new class of large language models that capture and partially explain semantic variation between people. We will (1) measure nuanced differences in word meaning and linguistic experience across individuals; (2) develop computational models that incorporate this variation; and (3) evaluate the extent to which the models capture behavioural and cognitive differences related to political affiliation, gender, and culture. This will advance our understanding of the nature and origin of individual differences as well as improve the calibration of AI systems for under-represented groups. These advances will support eventual applied outcomes in health, domestic security, and resilience to	82,208.50	189,481.00	170,718.50	153,184.00	89,738.00	0.00	685,330.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	misinformation. **National Interest Test Statement** Recent advances in artificial intelligence programs like ChatGPT have enabled the nuances of language to be modelled at scale, and offer potentially enormous technological and applied benefits. However, these models often fail to transparently capture the variation in meaning that occurs between individuals, especially those from groups (like Australians) that were under-represented in the text that the models were trained on. Our project aims to fill this significant gap. We will build on existing work to develop a novel computational model of meaning for specific individuals and groups, and then evaluate how these meaning differences are related to people's differences in cognition, behaviour, background, and linguistic environment. Besides improving our understanding of how experience shapes how we think, the project will help to address known biases in artificial intelligence (AI) so that it is better calibrated for Australians as a whole as well as some of the diverse communities that exist within our country. The new tailored models we develop will be useful for identifying and fighting targeted misinformation, improving intergroup understanding, and creating more targeted health interventions. Our dissemination strategy makes use of our extensive networks with other scientists, our established platforms for communicating with the general public, and our existing connections to end-users in defence, cybersecurity, and heath.												
DP240101935 Smith, A/Prof Kelly A	**Characterising a new regulator of the Hedgehog pathway** The Hedgehog pathway is crucial for embryonic development, and disruption causes multi-organ morphogenesis defects. The CI team has uncovered a new gene required for Hedgehog signalling in mouse, zebrafish, and Drosophila. Preliminary data hints at mechanism for this novel gene and shows it may in fact be a member of a new superfamily. The project will examine gene function and identify interacting protein partners, using the zebrafish, Drosophila, and cell-based models. Findings will provide basic knowledge about this mysterious gene and uncover how it modulates an essential pathway in embryonic development. This research is expected to impact knowledge generation, health, and well-being. **National Interest Test Statement** Each of us are born with organs that form a stereotypical shape and size. This is controlled by genes or molecules that signal to organs as they are forming, providing instructions for how to grow and organise. Because organs are highly sensitive to changes in these signals, animals have evolved ways to subtly increase or decrease signalling, providing exquisite control. Whilst we understand the major components of signalling, we do not fully understand how they are controlled. Recently, we have discovered a new gene essential for signalling control and the patterning of organs. Intriguingly, this gene is found in diverse species, such as animals, plants, and algae. This suggests it is an ancient gene and may teach us about evolution. The project will use multiple animal models to investigate the function and evolution of this gene. It will advance our biological knowledge of organ formation and generate new scientific methods and tools in the field of biology. The project will employ Australian researchers in highly skilled and specialised research, training them for jobs in academia, Industry, and the health sector. Beyond this project, it may also provide improved technology for stem cell-based therapies and diagnostics. Outcomes from this work include the generation of new knowledge, to be published in international journals, reported in press releases and via social media, and presented at both national & international conferences.	123,483.50	250,437.00	254,447.50	127,494.00	0.00	0.00	755,862.00			United States of America		
DP240101952 Bidwell, Dr Nicola J	**First Nations AI: Country, Climate, Communication** Our team of Indigenous and western scholars aims to develop a systematic account of artificial intelligence and its possibilities in climate change communication in remote First Nations communities in northern Australia. Working under Indigenous governance, we will establish spaces for Indigenous landowners and scientists to come together to probe diverse AI techniques for making sense of climate predictions and risks. We will build the capacity of Indigenous people to conceive and design AI, accounting	90,901.00	201,622.00	196,342.50	85,621.50	0.00	0.00	574,487.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	for divergent languages and knowledge systems. This is expected to lead to more effective and trustworthy communications about extreme weather and climate change, improving the preparedness and responses of remote First Nations communities. **National Interest Test Statement** Trusted and timely communications about the weather can saves lives. Artificial Intelligence (AI) offers new ways to help diverse communities prepare for and respond to the extremes that accompany climate change; for instance, warning messages can be automatically translated into local languages and real-time information extracted from social media. Yet, for AI to be effective, it must account for the ways that different communities interpret and act-on information, predict conditions and manage risks. This project will co-design cross-cultural communications about weather using AI by partnering with Aboriginal communities in the Northern Territory, the Bureau of Meteorology and industry engineers. We will improve the efficacy of AI by identifying factors that shape communicating about the mathematical models in weather forecasts. The project will build Aboriginal capacity in AI, and indigenous knowledge will improve the scientific accuracy of predictions and the outcomes of adaptation strategies. We will convey recommendations to improve public understanding of AI and weather alerts by video, media articles and technical demonstrations. Culturally sensitive AI promises to have many benefits for Australia: improving crisis communications, limiting fatalities and injuries, and reducing the costs of emergency response, healthcare, trauma and damage to property and economic activity. More generally, it will enhance the equity and impact of Australia's large AI investments.												
DP240102062 Utzschneider, Dr Daniel T	**Deciphering the immune complexity that orchestrates T cell activation** The adaptive immune system consists of a complex cellular network that can efficiently distinguish exogenous required inputs, such as nutrients, from those that are potentially harmful like pathogens. Such 'friend-foe' discrimination has its molecular basis in a multitude of receptors with specificity to certain ligands. Critically, however, it is unclear how such discrimination is mechanistically regulated at the functional level. We have developed new and sophisticated experimental models that will allow us to systematically dissect and unfold the complexity of the adaptive immune system and address this critical knowledge gap. Expected outcomes will critically advance our general understanding of a fundamental biological principle.	96,411.50	192,186.00	166,185.50	70,411.00	0.00	0.00	525,194.00			Switzerland		
	National Interest Test Statement A mammal's immune system can effectively distinguish if a foreign substance is safe, like food, or potentially harmful like a pathogen. While complex networks within our body are required for this vital function, it is still unclear how this works. Taking advantage of animal models specifically developed to address this crucial knowledge gap, we will dissect and unfold the complexity of the immune system to identify how organisms regulate such 'friend-foe' discrimination. The outcomes of this study will critically advance our general understanding of a fundamental principle relevant to all mammals, which includes livestock and endangered native animals, whose health is of critical value to agriculture and the tourism industries of Australia. Moreover, outcomes will fill critical knowledge gaps and generate new intellectual property that will afford excellent opportunities for research and development including the generation of new experimental models, which will be distributed to further amplify research output and impact. New knowledge generated by the project and the high-level international training of students will increase the competitiveness of the biotechnology sector in Australia and generate intellectual property that can be further developed by Australian Biotechnology companies into novel products for veterinary and health services to increase productivity. Critically, outcomes will be shared via social and print media to be accessible to the general public.												
DP240102088 Gong, Dr Mingming	**Causal Knowledge-Empowered Adaptive Federated Learning** Federated learning tools are a promising framework for collaborative machine learning (ML) that also maintain data privacy; however, their ability to model heterogeneous data remains a key challenge. This project aims to develop a	82,500.00	166,500.00	170,572.50	86,572.50	0.00	0.00	506,145.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	new learning scheme for coordinated training of ML models that successfully bridges variable data distributions. The framework proposed will be the first globally that can use causal knowledge to 1) handle data heterogeneity across devices and 2) address the real-world challenges when only a subset of devices have labelled data. Expected outcomes and benefits include the theoretical underpinnings and algorithms of causality-based collaborative training of ML models while better preserving the users' data privacy.												
	National Interest Test Statement												
	Artificial Intelligence (AI) and associated Machine learning (ML) systems are an integral part of our daily lives. ML models have traditionally been trained from a centralised dataset, but with data now increasingly distributed on network of devices (such as mobile phones, wearables, and Internet of Things sensors), an adaptive new training architecture is needed. Responding to this, our ARC Discovery Project will pioneer collaborative training of ML models on a network of different computing devices – delivering coordinated learning without data sharing. The research innovates in its fundamental theory, in its design of new learning parameters to address variable data quality across devices (including labelled and unlabelled data), and in its enhanced features for privacy protection. Developments from this project will promote Australia's competitiveness in securing a future share of the massive markets for artificial intelligence applications on mobile phones, wearables and other smart technologies. In this context, our research targets efficient collaborative training of ML systems on these devices to enhance their functionality, while preserving the users' data privacy. New software generated from the project will be released under open-source licence; articles produced for magazines, trade journals and researchers; and patenting explored for potential commercialisation and licensing opportunities for Australia targeting both local and global markets.												
DP240102160 Stok, A/Prof Kathryn S	**Replicating the cartilage micromechanical environment** Through a novel, image-guided mechanical evaluation of cell- and tissue-level remodelling, this project aims to unlock new insights into the complex mechanical microenvironment of cartilage and directly influence new strategies in tissue engineering. The research will reveal contributions of cells and extracellular matrix components to mechanical integrity over time. It will build a world-first strain map of the cartilage microenvironment and quantification of dynamic structural remodelling that occurs, providing key targets to improve tissue engineering strategies. The project will also drive innovation in micromechanical testing technology, deliver functional solutions in mechanobiology and advance materials for biological integration.	96,589.00	191,264.00	195,306.00	100,631.00	0.00	0.00	583,790.00			Switzerland, United States of America		
	National Interest Test Statement												
	Cells are continuously exposed to mechanical loads as we move about. They contain mechanosensors that respond to these stresses; for example, cartilage responds by remodelling to suit the loads it is experiencing. Different stresses (e.g. compression or fluid pressure) trigger different responses. Understanding the link between mechanical stimuli and the cellular response in cartilage is key to understanding joint biomechanics. In this project, we will develop a 3D model to analyse how cartilage cells respond to loads. Rather than elastic gel (which rebounds), our model mimics cartilage by supporting the cells in a medium akin to solid sand (solid but with fluid). Our unique hardware will allow image-guided micromechanical evaluation of the types of load cells are feeling and how they respond over time. The findings will unlock new insights into the complex mechanical microenvironment of cartilage and directly influence new strategies in tissue engineering. This project could lead to efficient and robust methods to determine the suitability of diverse materials for future use that integrate mechanically with a biological environment. Strong links with industry will encourage the use of our findings in real-world applications in biotech, agriculture and healthcare (e.g. to improve longevity of existing implant technologies). The wellbeing of many Australians would benefit from better treatment of musculoskeletal burdens, which could also save billions in healthcare costs.												
DP240102286	**Optimising disease surveillance to support decision-making**	66,233.50	141,047.50	145,908.00	71,094.00	0.00	0.00	424,283.00			England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Shearer, Dr Freya M	COVID-19 has demonstrated the critical role of epidemic data and analytics in guiding government response to pandemic threats, reducing disease and saving lives. The demand for epidemic analytics for response to threats of national significance will only grow. The goals of this project are to 1) determine the combination(s) of surveillance methods that provide the most useful data for epidemic analysis and 2) translate these findings into the blueprint for a next-generation infectious disease surveillance system for Australia. We will use a simulation-evaluation approach, coupling methods from infectious disease modelling with those from information theory optimal design. Outcomes will enable more tailored and effective pandemic response. **National Interest Test Statement** The COVID-19 pandemic exposed major shortcomings in infectious disease surveillance systems in Australia and globally. Surveillance data and associated analytics played a critical role during COVID-19: reducing disease spread and saving lives. However, it became clear that traditional disease surveillance systems are not designed to support real-time data analytics that provide critical evidence for decision-making. This project aims to develop the blueprint for a next-generation infectious disease surveillance system for Australia. A range of novel surveillance methods will be devised and implemented in an advanced modelling and simulation platform. Using methods from statistical information theory and optimisation, we will then determine the surveillance methods that provide the most useful data for decision-making. A diverse stakeholder panel will be consulted throughout the project to help guide our findings into a realisable blueprint. Implementing this blueprint would enable a more tailored, adaptive, and effective response to a range of pandemic threats in Australia— reducing their health, social and economic impacts, thereby maximising community wellbeing. The project team's networks and continuing leadership roles in providing epidemic advice to government will ensure the research results reach policymakers and public health authorities for implementation.												
DP240102334 Swearer, Prof Stephen E	**Improving the effectiveness of marine habitat restoration** Habitat restoration is a global priority to halt and reverse declines in biodiversity, but many of these efforts fail to achieve these goals. This project aims to improve the outcomes of marine habitat restoration through greater consideration of animal behaviour. Insights into how animals evaluate restored habitats and which components of habitats are most important to animals are essential but missing ingredients in modern restoration methodology. By applying novel experimental and modelling approaches to current marine habitat restoration programs, this project will generate new knowledge to underpin a fundamental change in how natural resource managers restore marine habitats, with significantly improved outcomes for biodiversity. **National Interest Test Statement** Climate change and other human stressors have led to extensive loss of Australia's coastal and marine habitats. The resulting declines in socio-economic, cultural and environmental values provided by these habitats directly affects the 85% of Australians that live within 50km of the ocean. While considerable effort and expense are currently being leveraged to restore these habitats, how, when and where habitat restoration should best be undertaken remains an important research gap. This project will improve knowledge about how animals respond to and benefit from shellfish reef and kelp forest restoration efforts, which will contribute to more effective methods for restoring these habitats. As Australia's coastal and marine habitats are projected to generate an economy worth $100 billion annually by 2025, this research will also have major economic and commercial benefits for Australia. Partnerships with government and non-government organisations will ensure that the research findings are fully implemented and explored, leading to improved biodiversity outcomes from coastal and marine habitat restoration projects in Australia.	96,888.50	198,095.00	200,257.50	99,051.00	0.00	0.00	594,292.00					

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240102343 Caruso, Prof Frank	**Engineering Functional Antimicrobial Polypeptide Surfaces** Antimicrobial coatings are vital in preventing bacterial contamination but a versatile solution does not exist. Structurally nanoengineered antimicrobial peptide polymers (SNAPPs) were recently developed to fight multidrug-resistant bacteria. To expand their application into antimicrobial coatings across a range of surfaces, a simple and universal coating strategy is needed. By developing phenolic-functionalised SNAPPs, this project aims to exploit the adhesive nature of metal–phenolic materials to rapidly coat diverse surfaces, including stainless steel and textiles. The expected outcome is the generation of antimicrobial polypeptide surfaces, which will have benefits in food safety, medical implant technology and advanced textiles.	97,956.50	200,242.00	208,501.50	106,216.00	0.00	0.00	612,916.00					
	National Interest Test Statement With widespread use of antibiotics in society, bacteria are increasingly developing antibiotic resistance. Known as superbugs, these resistant bacteria are challenging our healthcare to find new medicines and new ways to prevent infection. Prevention of infection is a global challenge beyond healthcare and medicine as bacteria can live on many surfaces including those in the food supply chain and on textiles. We will develop an emerging class of antimicrobial nanomaterials against multidrug-resistant bacteria using a simple and universal surface coating strategy. This new generation of antimicrobial nanomaterials will be anchored to surfaces by combining nanoengineered antimicrobial peptide polymers. We will promote our results through peer-reviewed publications and public presentations. Licensing of intellectual property will inform future research directions. Applications of these antimicrobial polypeptide materials can be used as coatings on medical devices, textiles and food packaging. This research will benefit Australia socially, economically, commercially and environmentally through the development of high-value materials and advances across multiple sectors. It will improve healthcare, reduce food spoilage and increase food shelf life. By tackling antimicrobial resistance impacting humans, foods, animals and the environment, this research aligns with the research priority area set in Australia's National Antimicrobial Resistance Strategy 2020 & Beyond.												
DP240102465 Stinear, Prof Tim S	**Dissecting bacterial signal transduction** Bacteria have feelings. They sense and respond to changes using proteins called two-component signalling systems (TCSS). These comprise a sensor which activates a DNA binding protein in response to specific cues (signals). Using state-of-the-art genetic techniques and a synthetic biology approach, this research aims to reveal for the first time how these complex bacterial TCSS networks interact. The outcomes will be a fundamental, new understanding of how bacteria sense and respond to environmental signals; a deep dive into how bacteria feel. This knowledge will be the basis for innovative approaches to harness bacteria in biotech such as vaccine production, biofuels, or clever therapeutic interventions to stop bacterial infections.	97,303.00	200,620.50	197,092.00	93,774.50	0.00	0.00	588,790.00			England		
	National Interest Test Statement Biotech encompasses technologies across agriculture, marine, health and environment that use bacterial processes to develop products. These processes in bacteria are controlled by molecular sensing systems. We need to deeply understand how these sensing systems work so we can harness the full biotech potential of bacteria to efficiently make high-value biologics such as enzymes, antibiotics, biofuels, animal and human vaccines, among other products. This project directly addresses that need and will generate fundamental new knowledge on how bacteria detect and respond to their environments by revealing for the first time the full complexity of these sensing systems. The research findings will have direct implications across the many biotech industries that rely on cornerstone industrial bacterial processes such as fermentations to make enzymes, vaccines and foods. This research will directly inform												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
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	bioengineering of bacteria to make high-value biologics. This in turn has the potential to create substantial national economic wealth in a global biotech market worth over $1000 billion and growing, aligning strongly with a pillar of Australian government long-term biotech strategic direction. We anticipate that the knowledge gained from these studies will be communicated widely through public presentations, media press releases, social media posts, formal publication in peer-reviewed scientific journals and incorporation into university undergraduate teaching curricula.												
DP240102642 Such, A/Prof Georgina K	**Unravelling Efficient Nucleic Acid Delivery Using Multilayer Nanoparticles** Developing smarter nanoparticles is critical for maximising the potential of biological therapeutics such as nucleic acids. Currently, the efficiency of nanoparticle delivery remains low due to the inability of carriers to migrate different biological regions. The aim of this project is to develop responsive polymer nanoparticles that can more effectively migrate cell barriers by a two-staged release based on the combination of different self-immolative polymers. This project will allow the development of design rules for understanding how nanoparticle structure can be optimised to improve nucleic acid delivery. This work will have important benefits such as developing new nanotechnology industry and skilled graduates for Australia.	92,393.50	186,542.00	190,727.50	96,579.00	0.00	0.00	566,242.00			Canada		
	National Interest Test Statement Nanoparticles are small structures that can be designed to protect drugs, only releasing cargo in a target site. The properties of these materials make them ideal for creating new and innovative products, including application for diagnosis and treatment of human diseases. Nanoparticles have been approved for use in humans and are increasingly common, as we have seen in recent times with the nanoparticle carriers used to manage the COVID virus. However, many challenges are faced in the process of nanoparticles being able to deliver fragile cargo to our body cells. This project develops new smart nanoparticles that can more effectively deliver biological therapeutics such as the nucleic acids to their site of action, by releasing active components in multiple stages. This research will have major economic and commercial benefits through the development of new nanoparticle technology that will generate industry investment and commercialisation opportunities. Partnerships with government and industry bodies will ensure that the research findings are fully explored, and commercial opportunities realised. This work is expected to have long-term impacts on improving treatment efficacy, preventing diseases and contributing to people living healthier and longer lives.												
DP240102721 Lynch, Prof Gordon S	**Interrogating the extremes of skeletal muscle plasticity in vertebrates** This project aims to interrogate how muscles adapt to growth and endurance stimuli at different stages of life, relevant to addressing challenges facing the world's ageing population. Using innovative gene technologies and molecular physiology in zebrafish and mice, this project will answer important, unresolved questions in muscle biology. The project will generate knowledge needed to develop interventions to improve quality of life for older Australians and address the physical realities of an ageing workforce. Benefits extend to enhancing workplace safety and productivity, improving farming efficiencies for livestock and aquaculture industries, and training emerging leaders in the biological sciences.	81,780.00	169,688.50	175,668.50	87,760.00	0.00	0.00	514,897.00					
	National Interest Test Statement Skeletal muscle's ability to adapt to life's challenges decreases throughout the lifespan and represents a critical challenge for the world's ageing population. To understand how muscle adaptation is regulated at a molecular and cellular												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	level, and the implications for muscle function, this project aims to interrogate how muscles respond to growth and endurance signals using innovative gene technologies and molecular physiology tools in different animals. The project seeks to address some of the most intriguing and unresolved questions in muscle biology relevant to development and ageing, and to generate knowledge to improve quality of life for all Australians, while addressing the physical realities of an ageing workforce. Further benefits extend to enhancing workplace safety and productivity, improving farming efficiencies for livestock and aquaculture industries, and facilitating the mentoring of emerging leaders in the biological sciences. The research outcomes have far-reaching impact and will be communicated broadly through the broadcast and print media, news and business channels, social media and community platforms.												
DP240102799 Waycott, A/Prof Jennifer	**Co-designing Innovations in Digital Storytelling with Older Adults** This project aims to investigate how emerging technologies can be leveraged to provide innovative ways for older adults to create and share their life stories to foster social wellbeing. Later life can be a time of considerable change, leaving people feeling disconnected from the people, places, and life events that are important to them. Autobiographical storytelling can help create links with one's past, but little is known about how technologies such as digital games and virtual reality can be used to enable older adults to share stories about their lives in a way that supports ongoing social interactions. This project is expected to co-design new forms of digital storytelling to improve social wellbeing of older adults.	84,866.00	195,274.50	213,149.50	102,741.00	0.00	0.00	596,031.00			United States of America, England		
	National Interest Test Statement Ageing well has social, health, cultural and economic benefits for Australia. Ageing well means not just staying healthy, but also staying socially engaged. Yet, social wellbeing can be threatened by the changes associated with ageing, such as retirement, bereavement, and declining health and mobility. For many older people, sharing autobiographical stories can be a valuable way to communicate their identities as people who have lived rich and full lives. Storytelling through short digital videos that capture life events and experiences, is one strategy for sharing older adults' stories. The Australian Association of Gerontology nominated digital storytelling as its "hot topic" for 2023, but noted that digital storytelling is currently underutilised. Also, current forms of digital storytelling support one-way communication only, missing any ongoing social interactions between the storyteller and their audience. Our project will identify how new technologies can be used to create digital stories that are interactive and playful. It will enhance the social connectedness and wellbeing of older Australians, contributing to ageing well by supporting their social and cultural participation. We will share guidelines for using new forms of digital stories in workshops with seniors' groups and care providers. This will promote one of the goals of Australia's new cultural policy: that all people can be storytellers, and that all audiences can experience their stories.												
DP240102812 Heath, Prof William R	**Defining pathways that control T cell lifespan for long-term immunity** This project will investigate the cellular and molecular pathways regulating lifespan of tissue-resident memory T cells (Trm cells), a non-circulating T cell subset that play a crucial role in the frontline defence against infection. Significantly, how long Trm cells live is paramount to how long immunity is sustained. Using cutting-edge cellular and molecular techniques, the expected outcomes of this project include identification of the genes and processes that control lifespan. This should provide significant benefits in the basic knowledge of how longevity of immunity is regulated. This understanding will be useful for future immunotherapeutic applications, such as veterinary or human vaccines requiring maximal duration of immunity	121,094.00	280,053.00	287,790.00	128,831.00	0.00	0.00	817,768.00			New Zealand		
	National Interest Test Statement												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	In vertebrates, the immune system is used to fight infections (e.g. by viruses or parasites). A key property is that certain immune cells 'remember' an infection so can quickly act if reinfection occurs. This is the basis of how vaccines work. As shown with COVID-19 vaccines, this immune memory may not last forever. We have discovered that how long immunity lasts is affected by properties of the original exposure (e.g. the type of infection or vaccine). This project will investigate certain immune cells that give long-term immunity to define properties affecting their lifespan. This knowledge could enable us to extend the length of cellular memory and thus of immune protection. Beyond this application, findings could lead to development of vaccines that give longer protection, potentially improving the health of humans, livestock and pets. Future research may also enable shortening of harmful immune responses, potentially helping people and animals with autoimmune diseases (e.g. diabetes). The findings apply to a broad range of contexts and could bring economic benefits to the Australian biotechnology sector. Training and mentoring the early- and mid-career project members will develop future Australian scientific leaders and build links to established international networks. Our work with a NZ biotech startup illustrates a pathway for translating outcomes. The findings will be communicated through the media and social media, including activities on the Day of Immunology.												
DP240102823 Gayen, A/Prof Bishakhdatta	**THE BASAL MELTING OF ANTARCTIC ICE SHELVES** The project aims to determine the mechanisms that govern melting of Antarctic ice shelves into the ocean. Faster basal melting of ice shelves in the warming ocean is contributing to loss of grounded ice from Antarctica and increased glacier speeds, and melting is projected to become a larger contribution to future global sea level rise. Using unique laboratory experiments, turbulence-resolving computation and theoretical analysis the project will evaluate the roles of meltwater, ocean currents, internal wave breaking and water exchanges between the continental shelf and sub-ice cavities. The results will assist our understanding of measurements made in Antarctica and more reliable predictions of sea level rise.	66,000.00	146,500.00	155,500.00	75,000.00	0.00	0.00	443,000.00			England, United States of America, India, Norway, New Zealand		
	National Interest Test Statement Over the past decade melting of the Antarctic and Greenland ice sheets has contributed to around 40% of global sea level rises. Much of this melting is occurring in West Antarctica and is thought to be caused by warmer and saltier water from the Southern Ocean pushing its way into shallow waters on the Antarctic continental shelf and interacting with the ice shelves. To better plan for future sea level rises it is very important to know how fast the ice sheets are melting and how much the melted ice will contribute to sea levels. As it is very difficult to measure flow properties under the ice shelves and the way the melting occurs, current predictions about the melting rate are not precise. This project will develop world-leading basic knowledge of the physics of ice shelf melting in Antarctic seawater using experiments and simulations. Expensive measurements made under the Antarctic ice shelves will be more effectively interpreted. New ocean observations and climate models with improved melting schemes will allow better predictions to be made about changes in the Antarctic ice sheets. New knowledge will be widely disseminated to relevant scientific and government agencies through articles and media. Accurate predictions are critical for policy makers across the globe and are particularly important for Australia where our coastlines are long and highly populated. Supporting Australia prepare for sea changes due to climate change is an important environmental benefit.												
DP240102899 Karoly, Dr Philippa J	**Understanding multiday cycles underpinning human physiology** We recently discovered long-term rhythms modulating activities of our brains and hearts ranging in duration from 3-60 days. The cause of these longer, 'multiday cycles' remain unknown. This project aims to understand; causes of multiday cycles (measuring the nervous and autonomic nervous system), their effects (on cognition, sleep, and stress), and quantify the relationship between coupled cyclical systems. The research outcomes can provide fundamental new knowledge about cyclic dynamics governing human physiology, leading to improved rigour in life sciences research. Commercial outcomes include technology to optimise individual productivity, learning,	163,353.00	255,422.50	92,069.50	0.00	0.00	0.00	510,845.00			United States of America		

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	health, and wellbeing based on physiological cycles, with diverse benefits to society. **National Interest Test Statement** Our bodies have natural cycles, such as circadian (24-hour) rhythms, which affect a range of human functions. We recently discovered another cycle modulating activities of our brains and hearts ranging in duration from 3-60 days. The cause of these longer, 'multiday cycles' remain unknown. Up until recently measuring multiday cycles was too challenging due to long timescales and complex interactions between the brain, heart and stress hormones. Our breakthrough discovery of a rhythmic biomarker in humans, however, will now allow continuous tracking of multiday cycles. This project will track unique multiday cycles while monitoring the brain, heart, sleep and stress response in healthy adults to understand these long rhythms for the first time. New knowledge will be widely disseminated through scientific and industry stakeholders. In collaboration with our corporate partner, Seer Medical, (and research agreement with Fitbit/Google) we will use our proven commercial translation of multiday cycles to develop new lifestyle and workplace products, providing commercial benefits. Understanding multiday cycles will inform time constructs underpinning society, such as the 7-day week, providing social and cultural benefits. As multiday cycles can be used to optimize performance of workers, the project has economic benefits in high-risk industries where managing concentration or fatigue are critical - construction, transport, healthcare.												
DP240102905 McCluskey, Prof James	**The molecular basis of T cell receptor cross-reactivity between MHC and MR1** This project aims to investigate how newly discovered immune cells, known as 'MR1T' cells, function in the body. Preliminary evidence shows that MR1T cells can kill stressed cells. This project expects to generate new knowledge describing precisely how MR1T cells target and kill stressed cells. Expected outcomes of this project include to refine research techniques and models, foster interinstitutional collaborations, and further develop our theory on MR1T cell function. This project should provide significant benefits, such as publication of research articles in high impact journals and generation of experimental tools sought after by researchers in the field. **National Interest Test Statement** Immune cells are critical to the ability of animals and humans to fight infection and disease. This project focuses on a newly discovered type of immune cell that kill stressed cells that no longer function properly. It is not understood how these immune cells target and kill stressed cells and if they can get confused and inappropriately kill healthy cells. It is vital to understand how immune cells are regulated to prevent unnecessary damage. We seek to describe how these immune cells function in mice and humans by examining them in blood and tissue samples using innovative and interdisciplinary research techniques. We expect the knowledge and expertise gained from this project to be published in high impact open access journals and to be of interest to the wider community, accessible through engagements with media, social media and public lectures. The outcomes of the project may lead to long-term commercial interest for the development of immunotherapies, particularly to skin cancers, which are most common among Australians.	103,960.00	204,023.00	198,212.50	98,149.50	0.00	0.00	604,345.00					
DP240102907 Simpson, A/Prof David A	**Diamond Voltage Microscopy: A new tool for neuroscience** This project aims to develop an optoelectronic voltage imaging microscope that can capture the sub-cellular electrical dynamics of neuronal networks. This will be achieved by leveraging the team's technological breakthrough in the production of near-surface fluorescent defects in semiconducting diamond, which can optically detect local changes in electric potential. The expected outcomes of the project are a new microscopy modality and experimental framework which enables in vitro electrophysiological stimulation and recording at network	80,000.00	155,000.00	150,000.00	75,000.00	0.00	0.00	460,000.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
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	scale and with single-synapse resolution. This will provide a much-needed tool to understand mechanisms underlying learning, memory formation and recall, and cognitive decline. **National Interest Test Statement** This project capitalises on a recent, Australian-made breakthrough in voltage imaging technology, which can be used to measure neural activity in animal and human brain cells. It aims to address a critical unmet need in the study of neural circuits by developing a microscopy platform that can visualise voltage signals within neurons with unprecedented resolution and scale, while also integrating seamlessly with the vast number of optical techniques used in modern neuroscience. This project will improve our understanding of the mechanisms underlying learning and cognitive function in the brain. Australia is a world leader in neurotechnology development, and the knowledge and techniques developed in this project will advance Australia's competitiveness in this rapidly growing global market to providing significant economic benefits for the country. The intellectual property generated will also provide commercial benefits for Australian companies in the advanced manufacturing and health industries. Research outcomes will be promoted by protecting this new intellectual property via patents. Together with the existing intellectual property, these patents will comprise a suite of licenses to enable Australian industry to translate the research into new tools to improve neurological disease treatment and drug discovery.												
DP240103054 Thompson, Prof Russell G	**A modelling framework for designing more sustainable urban freight systems** How to improve the sustainability of goods movement in cities is a major challenge for society. City logistics involves numerous stakeholders, including carriers that are small and independent and have difficulty achieving high levels of efficiency. This project aims to develop an integrated modelling framework to facilitate the exploration of novel urban logistics initiatives that are more connected, collaborative, and open. The framework combines agent-based simulation, optimization, artificial intelligence and digital twin technologies to design and evaluate new schemes for improving the efficiency, reliability, and sustainability of urban logistics systems, which will alleviate congestion and the need for new road infrastructure. **National Interest Test Statement** Major cities in Australia have large metropolitan areas with low population densities. Goods delivery services comprise of independent networks of trucks, vans and warehouses that are under-utilised. Growth in demand for eCommerce and imported goods is increasing the amount of freight vehicles in cities, raising traffic congestion and pollution. Traditional solutions, such as increasing road capacity, won't lower emissions and is very expensive. Various schemes, such as crowd-shipping, consolidation centres and on-line market places, have potential to improve sustainability of urban delivery systems, but current planning tools are limited. This project will develop a new tool to improve the sustainability of urban freight systems. This tool will design and evaluate new schemes considering all stakeholders - freight shippers, carriers, receivers and residents. Models will assess the benefits to stakeholders and predict the reduction in vehicle emissions and operating costs. Translation and potential comercialisation of the results will be accelerated through demonstrations to relevant industry and government networks. The research will have economic, social and environmental benefits to Australia. As well as providing a better service to customers, improved efficiency of urban freight systems will reduce operating costs, improve road congestion and reduce emissions, improving the livability of major cities in Australia.	93,984.50	193,346.50	203,412.00	104,050.00	0.00	0.00	594,793.00					
DP240103352 Bedggood, Dr Phillip A	**Ultrafast tracking of physiological processes in the human eye** Recent developments in high-resolution imaging allow individual cells in the living eye to be studied at very high speeds. This project aims to explore a new class of scientific observations of rapid phenomena including: the capture and conversion of light energy to electrical energy, the spread of pressure waves through delicate networks of	156,522.50	257,307.50	211,921.00	111,136.00	0.00	0.00	736,887.00					

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	blood vessels, and fast eye movements used to navigate the visual scene. This project expects to generate new knowledge about these processes using state of the art technology, to reveal more about how the eye and visual system work. Our novel measures of physiological function will offer significant future benefit in the early diagnosis and treatment of disorders occurring at the cellular level.												
	National Interest Test Statement												
	This project will develop cutting edge tools to study individual cells in the living human eye at ultrafast speeds. Such speeds are required to observe how light-sensing cells capture light and convert it into electrical signals, how blood cells are routed through the finest capillary beds, and how the eyes move to locate objects of interest. These interconnected functions are required to produce the sense of sight that most of us take for granted. By developing the tools to study these processes we will not only advance the science of vision, but will leverage these developments in future projects to study disease at the earliest possible stage -- when only single cells are affected. Our tools will ultimately provide new diagnostic utility and aid the discovery of novel therapeutic approaches across a range of diseases including macular degeneration, diabetes, stroke, and dementia. Such conditions are ubiquitous in Australia, especially in our ageing population, and represent a significant burden on quality of life and the costs of health care. The findings from this project have great potential for commercial development that will provide significant benefit to the Australian economy and broaden the reach of our findings beyond academia. The study of cells in the living eye should capture the minds of the public and venture capital alike; we will engage significantly in public talks, popular articles, and social media and press releases to further awareness of our research.												
	The University of Melbourne	4,272,407.00	8,881,645.50	8,592,160.50	4,284,410.50	328,954.00	27,465.50	26,387,043.00					
Victoria University													
DP240101449	**Predictive Biomechanics for Modelling Gait Stability and Falls Prediction**	130,354.50	205,779.00	200,779.00	125,354.50	0.00	0.00	662,267.00			Japan		
Begg, Prof Rezaul K	Efficient, adaptive locomotion is critical to our independence, but it is adversely affected by neuromuscular disorders due to trauma, ageing and other impairments that increase the risk of balance loss and falling. This project investigates the extraordinary possibilities of advancing from the traditional laboratory-based, retrospective, gait research paradigm, to real-world gait monitoring using predictive biomechanics. By employing artificial intelligence, wearable sensors' data will predict balance loss and alert the user. The outcome will be fundamental knowledge for developing wearable systems to reduce the catastrophic impact of falls, with public health cost savings and improved quality of life for people with restricted mobility.												
	National Interest Test Statement												
	By 2066 it is expected that the number of Australians aged over 65 years will reach 11 million. One in three older adults fall each year and in this age group they are the leading cause of injuries, costing Australia $3.6 billion annually. Our project has the capacity to preserve the quality of life of at-risk older Australians using an intelligently-controlled, predictive, autonomous system. Such innovations would relieve increasingly unsustainable financial pressures on healthcare. It is estimated that a 1% reduction in falls would contribute $32 million a year in cost savings. The effectiveness of current interventions in reducing falls is, however, seriously limited, because they do not actively prevent balance loss in the real-world. By integrating artificial intelligence with wearable sensors our aim is to predict balance loss and incorporate that technology into fail-safe systems that can prevent falls in everyday settings. These systems will monitor balance and enable the design of reliable, cost-effective screening procedures by assessing the individual’s capacity to maintain balance across a range of destabilizing conditions. The application of this technology will allow people identified as high-risk to be fitted with a wearable stability-monitoring system that can warn of impending balance loss and avert a fall.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
DP240102155 Eynon, Prof Nir	**Sex-specific epigenetic atlas across lifespan** This project aims to uncover sex-specific molecular marks that either predict or mediate healthy ageing across multiple tissues in humans. This project expects to generate new knowledge of cellular heterogeneity and epigenetic control of phenotype and healthy ageing. Further, we anticipate to uncover age-associated changes that differ between males and females, an area of chronic research under representation. These outcomes will lead to a comprehensive understanding of fundamental biological processes across lifespan, and our development of an open access atlas will underpin evidence-based personalised health strategies to keep Australians healthier for longer.	80,970.00	192,827.50	223,715.00	111,857.50	0.00	0.00	609,370.00			Denmark, China (excludes SARs and Taiwan)		
	National Interest Test Statement Approximately 15% of Australians are over 65, and this proportion is expected to rise to 23% by 2050. The expenditure for an average patient over 65 is 3-5 times higher than for an average patient under 65. “Ageing well” must be a global priority both from an economic and a population health perspective. This project aims to uncover novel molecular indicators that slow the ageing process in males and females, and those which predict ‘faster’ ageing. This will lead to a much better understanding of how humans respond to changing environments during their lifetime, and will underpin future evidence-based personalised and targeted health interventions to keep Australians healthier for longer. Further, the National Action Plan for Critical Technologies includes in its List of Critical Technologies in the National Interest: Genome and genetic sequencing and analysis (Next Generation Sequencing). Our novel analyses and pipelines, ALL made publicly accessible will promote Australia’s expertise in this area and build the capacity of local researchers. The outcomes of this project will therefore have significant economic and social benefits to the Australian community.												
DP240102317 Wang, Prof Hua	**Differential Evolution Framework for Intelligent Charging Scheduling** Smart charging scheduling is a vital challenge as dynamic environment with traffic networks and various unexpected issues. This project aims to develop a differential evolution framework for intelligent charging scheduling. The framework consists of a comprehensive charging scheduling model with various road networks and factors. The project outcomes include a distributed evolutionary computation framework, differential evolution algorithms, and cooperative co-evolutionary strategies. The outcome results will be demonstrated by practical evaluations over public datasets and comparisons to related works. The project is beneficial to the nation in both theory of artificial intelligence techniques and applications of real transport systems.	105,000.00	210,000.00	210,000.00	105,000.00	0.00	0.00	630,000.00					
	National Interest Test Statement This project will provide theory and practical demonstration of building a reliable and robust system for intelligent charging scheduling, planning and coordinating the charging of electric vehicles at designated charging stations. The intelligent charging scheduling system considers all types of road networks and various factors, such as station selection and the amount of energy to be charged, ensuring that electric vehicles can be charged efficiently and effectively without disrupting power grid or causing long wait times. The resulting system, including an evolutionary computation-driven framework, can be made freely available to Australian government and companies for better charging scheduling services that balance individual benefits to drivers and overall network performance for city managers. Besides, the outcomes of this project include a comprehensive charging scheduling model, evolutionary algorithms, cooperative co-evolutionary strategies, and a differential evolution framework as a service that efficiently optimizes intelligent charging scheduling. Optimizing charging scheduling brings significant benefits such as saving energy, reducing road congestion and improving transportation network utilization. The results of the project are state-of-the-art and significant regarding intelligent transport systems with emerging applications to governments and industry												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	environments.												
	Victoria University	316,324.50	608,606.50	634,494.00	342,212.00	0.00	0.00	1,901,637.00					
	Victoria	12,366,000.50	25,609,336.50	24,987,563.50	12,308,831.50	592,069.50	27,465.50	75,891,267.00					

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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Western Australia

Curtin University

DP240100014 **Unlocking the potential of poly(ionic liquids) for electrochemical sensing** 67,927.50 143,738.50 157,699.50 81,888.50 0.00 0.00 451,254.00 Spain

Silvester, Prof Debbie S

This project aims to create new science that will enable the development of low-cost, miniaturised electrochemical sensors based on poly-ionic liquids. The chemistry of the materials will be tuned to selectively detect hazardous pollutants to enable trace concentration detection at analytically relevant levels. Fundamental behaviour of gases and solid contaminants dissolved in poly-ionic liquid/ionic liquid membranes will be uncovered, and their performance for sensing in real environments will be examined. It is expected that these advances will transform detection methods by taking sensing out of the lab and in to the hands of the everyday person, giving rapid and accurate knowledge about the concentration of hazards in the environment.

National Interest Test Statement

The COVID-19 pandemic has highlighted the benefit of fast-responding, accurate sensors to detect the SARS-CoV-2 virus without the need for complex instruments. However, there are many more hazards that Australians are exposed to on a day-to-day basis, particularly in industries with routine exposure to toxic chemicals (e.g. painting, fumigation, refrigeration, fuel filling and mining). Currently, there are few sensors that are widely available for determining chemical hazards in our surrounding environment. This project aims to explore a new approach to chemical sensing by using poly-ionic liquids as new membrane materials in highly robust, miniaturised, leak-free sensor devices. The chemistry of the materials will be carefully designed to target chemical hazards that are present in the air and in water bodies such as polluted lakes and rivers. This project will offer government agencies, mining companies and industries the ability to detect hazardous substances in a simple, cost-effective, user-friendly method that can be used by non-scientists. The knowledge generated in this project can be used by our industry contacts to design rapid, portable, low-cost, miniaturised sensors to identify risks to both humans and the environment, and implement the necessary controls. The innovation will result in significant cost and operational-safety benefits to Australian and overseas industries where monitoring of exposure to toxic substances is critical.

DP240100927 **Precarious housing, housing assistance and wellbeing** 100,000.00 175,000.00 150,000.00 75,000.00 0.00 0.00 500,000.00 Netherlands

Ong ViforJ, Prof Rachel

Australia’s housing system is undergoing a major transformation, marked by growing precariousness that has now spread across all housing tenures. The wellbeing impacts of this are not well-understood. This project aims to develop a contemporary conceptualisation of housing precariousness as a multidimensional experience that exists in potentially variable ways for renters, owners and the marginally housed. Using mixed methods and cross-country analyses, the project expects to produce new evidence on pathways in and out of precariousness, as well as the coping strategies and wellbeing of the precariously housed. This is expected to offer major benefits by informing housing assistance policies that promote the wellbeing of Australians.

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Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	National Interest Test Statement Australia's housing system is undergoing a major revolution. People's housing conditions are becoming more precarious, and this is a housing crisis because it affects Australians in all tenures, not just low-income renters. We do not know enough about people's precarious housing experiences to formulate effective policies to assist them. This project will address the precarious housing problem by tracking how people's life journeys lead some into precarious housing, how badly their wellbeing is affected, and finding out what support they need to escape precarious housing. By asking precariously housed people to share their experiences and analysing policies from different countries, this project will reveal whether current housing assistance programs are helping to protect the wellbeing of the precariously housed. This project benefits housing policymakers and Australians more broadly by increasing our understanding of how to provide housing support that is secure, affordable and suitable to meet Australians' needs and aspirations. This project's findings can be used to develop policies that give people more protection from the negative effects of precarious housing on their lives. We will actively drive change by sharing our findings with organisations committed to supporting Australians in precarious housing through small group discussions and a national policy workshop involving housing policy change-makers.												
DP240100966 Allentoft, Prof Morten E	**eGenomics - Next generation biomonitoring of threatened species** DNA is the molecule of life and exists everywhere in the environment as a largely untapped source of information on evolution, biodiversity, and ecosystem health. Our overriding aim is to start mining that information to benefit threatened species. Based on optimized ancient DNA methods, powerful sequencing technology, whole genome analyses, and RNA profiling, we present a novel and holistic framework for genetic biomonitoring. In two parallel model systems we will study corals and reptiles to improve environmental detection while simultaneously obtaining information on their population health. This will foster more efficient conservation of endangered species that are of tremendous importance to our marine and terrestrial ecosystems.	88,487.00	182,852.50	161,674.50	67,309.00	0.00	0.00	500,323.00			United States of America, Denmark, New Zealand		
	National Interest Test Statement The global biodiversity crisis is real and ongoing, and efficient tools to monitor the richness and health of our biodiversity are at the forefront of our fight against this crisis. This project will deliver new, cutting-edge, molecular technology to improve detection of rare and endangered species in both marine and terrestrial environments, while simultaneously providing information on their population health and viability. This will allow for more efficient conservation management to preserve our unique biodiversity which ultimately benefits us all. The 2016 State of the Environment Report identified that conserving animal, plant, microbial and genetic resources for food production, agriculture, and ecosystem functions such as soil fertility and pollination of crops, is critical for the ongoing ecological, cultural, and economic sustainability, health, and wellbeing of Australia. With increasing threats from climate change and other anthropogenic impacts, it is imperative that we can measure ecosystem health and stress in real-time, and the provision of the proposed eGenomics framework to relevant government and conservation organisations has the potential to deliver that.												
DP240101184 Bray, Prof Igor	**Electron-molecule collisions in fusion and astrophysical plasmas** This project will apply innovative methods developed in Australia to accurately model electron collisions with diatomic hydrides. It will generate new knowledge of the dynamics underlying fundamental chemical reactions, and bring international scientists together to study the influence of molecules in plasmas more accurately than ever before. Outcomes will include essential diagnostics for fusion reactors, methods for using the James Webb Space Telescope to study astrophysical clouds, and strengthened ties between Australia and the global plasma physics	70,000.00	140,000.00	140,000.00	70,000.00	0.00	0.00	420,000.00			Germany, United States of America, Italy		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	community. The significant benefits will include accelerating the development of fusion technology as an alternative to fossil fuels, and furthering our understanding of stellar evolution.												
	National Interest Test Statement												
	Australia has historically been at the forefront of the field of atomic collision theory, and we are now in the midst of rapid progress in the more complex studies of molecular collisions. This project will apply advanced computational techniques to accurately predict the outcomes of electron collisions with diatomic hydrides such as H2, HeH, LiH, BeH, and more. Such data are essential in fusion plasma modelling and astrophysics, yet are mostly unknown. Via international collaborations with fusion researchers and astrophysicists, the project will lead to the development of plasma diagnostic tools for the International Thermonuclear Experimental Reactor, the largest fusion experiment in the world, and new techniques for studying astrophysical clouds. The outcomes of this project will represent an important contribution from Australia to the global effort to develop fusion technology, which will provide a safe and clean source of electricity to meet humanity's growing energy needs and disrupt the fossil fuel industry by reducing carbon emissions and ensuring the energy needs of future generations are met. This will be a major factor in meeting the UN sustainability goals of affordable and clean energy and climate action. The project will provide training for early-career scientists in Australia in advanced computational and modelling techniques, making them ready to contribute to the nation in defence, industry and academia.												
DP240101210 Kadyrov, Prof Alisher	**Ion-atom collision data for fusion energy, hadron therapy and astrophysics** This project aims to combine experimental and theoretical efforts to generate accurate data required for the development and maintenance of fusion reactors, treatment planning in hadron therapy of cancerous tumours, and modelling astrophysical phenomena. Hadron therapy has been used successfully worldwide for over a decade with Australia's first such facility, the Bragg Centre for Proton Therapy, currently under construction. Fusion reactors are a source of abundant green energy. Immense progress is being made in their construction and underlying technology. Currently, there is an urgent demand for accurate data on ion-beam collisions with atoms and molecules for the aforementioned applications. This project intends to meet this demand.	47,653.00	134,776.50	142,168.00	55,044.50	0.00	0.00	379,642.00			United States of America, Germany		
	National Interest Test Statement												
	Rising worldwide demand for energy, increasing pollution, and climate change accelerated by the extensive use of fossil fuels, calls for the development of new means of power production to minimise the impact on the natural environment while maximising energy output. The International Thermonuclear Experimental Reactor (ITER) aims to fuse particles and harness the energy released to produce electricity. This large-scale international project aims to demonstrate the feasibility of producing green energy that is millions of times more efficient than burning coal, with no pollution and significantly less radioactive waste than traditional nuclear reactors. ITER demands state-of-the-art scientific knowledge to succeed. Activating hot fusion reactions requires carefully controlled heating of plasma fuel to temperatures of millions of degrees. ITER injects beams of atoms for heating and diagnostics of fusion plasmas. Currently, there is an urgent demand for accurate data on collisions of these beam atoms with plasma particles. Through our collaboration with the International Atomic Energy Agency (IAEA), we will provide vital data required for ITER. This project is aligned with Australia's Science and Research Priority area of Energy. Australia has had a formal cooperation agreement with the ITER organisation since 2016. The project will strengthen Australian involvement in ITER. It will promote the benefits of fusion energy research to Australia in the wider community.												
DP240101710 El-Mowafy, Prof Ahmed	**Next-generation Navigation by Mega-constellations LEO Satellites** This research will explore a novel positioning approach using new mega-constellations low-earth-orbit satellite communications signals to address a severe limitation of Global Navigation Satellite Systems (GNSS). It will	51,066.00	200,756.00	268,509.00	118,819.00	0.00	0.00	639,150.00			Netherlands		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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	facilitate improved positioning for services that rely on satellite positioning in challenging environments where GNSS signal visibility is limited, and where accurate positioning is needed. Expected outcomes are generating new knowledge in using satellite internet signals for navigation, advancing our satellite positioning capability essential for vital applications such as transport, mining and defence, and developing technologies to increase Australia's satellite innovation capacity with global scalability.												
	National Interest Test Statement												
	Global Navigation Satellite Systems (GNSS) are essential for many vital sectors in Australia; including transport, defence, mining, agriculture, and safety-critical navigation applications. However, GNSS signal blockage occurs in challenging environments, like urban areas, bushland and indoors, resulting in unreliable or unavailable Positioning, Navigation and Timing (PNT) solutions. GNSS signals are also vulnerable to "spoofing" and radio frequency interference. This project aims to develop a novel concept that addresses these severe limitations of GNSS, by exploiting opportunistic signals that are transmitted from the new mega-constellations of low-earth orbiting (LEO) communications satellites. It will facilitate improved services that rely on satellite positioning in challenging environments, and where reliable positioning is needed. The Australian Space Agency has identified the tremendous economic, social and environmental benefits of PNT for Australia; through increased productivity, better safety outcomes, and improved environmental management. Expected outcomes are generating new knowledge in using satellite signals for navigation, advancing our satellite positioning capability, and developing technologies to increase Australia's satellite innovation capacity with global scalability. The outcomes of the project will be shared with Australian industry and government agencies, and popularised to the broader society via mainstream and social media.												
DP240102689 Briggs, A/Prof Robert	**Living Together: New Approaches to Multispecies Conflict and Coexistence** Building on the methods and concepts of the emerging environmental humanities, this project will produce a new conceptual vocabulary for a world in which multispecies conflict and coexistence is increasingly important. It brings critical and generative rereadings of classical political thought and contemporary biopolitical and cosmopolitical approaches into dialogue with a set of empirical case studies emerging from novel encounters between humans and other animals. This project will expand Australia's knowledge base and research capacity in the interdisciplinary environmental humanities and stake out new approaches to the question of living together in a changing environment.	58,888.00	126,759.00	139,072.00	117,515.00	46,314.00	0.00	488,548.00			France		
	National Interest Test Statement												
	Relationships between humans and other animal species are frequently a subject of contention. Presently, these relationships are more complex and important than ever. From species extinction through wildlife management to companion animals, sites of contact, conflict and cohabitation with animals are multiplying. This project examines human-animal relationships in their social and environmental contexts in order to deepen our understanding of the obstacles to and possibilities for coexistence. The project includes a series of detailed case studies that range from conservation and captivity to agriculture and bioscience. Bringing philosophical research into conversation with empirical case studies, this project will improve our understanding of how humans and animals might live together in mutually sustaining ways in difficult times. The research will benefit Australians by creating new resources and approaches to cohabitation that will help to reduce existing conflicts over how we ought to treat and live with animals, conflicts with significant economic, social, and environmental consequences. The findings will be shared with a wide audience, including the public and relevant industry and government groups, through targeted publications, outreach activities and contributions to appropriate public affairs media.												
DP240102996	**Optimizing benefits of cultural diversity in Australian healthcare sector**	63,090.00	135,872.50	154,122.50	81,340.00	0.00	0.00	434,425.00			Germany		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Sharma, Prof Piyush	Australian society and workplaces are increasingly becoming culturally diverse with growing numbers of immigrants from culturally and linguistically diverse (CaLD) backgrounds. However, it is not clear to what extent this diversity is being harnessed to improve organisational performance by leveraging the diverse range of knowledge and skills of CaLD customers and employees. This project aims to use social identity theory and role theory to develop a comprehensive conceptual model for the process by which organisations identify, acknowledge, engage, accept, and adapt to cultural and linguistic diversity among their customers and employees. We also plan to test this model with data from customers and employees in Australian service sector. **National Interest Test Statement** Australia has become a multicultural society, with almost half its population either born overseas or with at least one parent born overseas. This cultural diversity is also reflected in Australian workplaces, particularly in the healthcare services sector, which is one of Australia's biggest employers and has a significant proportion of its workforce and patients from culturally and linguistically diverse (CaLD) backgrounds. Hence, it is essential that healthcare services providers understand the differences in the prior knowledge and experiences of these diverse groups of employees and patients, in order to meet their expectations by providing culturally appropriate services. However, despite the growing importance of cultural knowledge and cultural gap bridging (CGB) behaviours, current evidence shows that Australian organisations are still not ready to engage with their culturally diverse workforce and patient base in a meaningful manner. This project aims to address this gap by using an integrated multilevel process model to examine the antecedents and outcomes of multicultural readiness and CGB behaviours in a highly culturally diverse workforce. The project outcomes will assist Australian healthcare services providers to create more productive workplaces and provide better patient care to their patients from CaLD backgrounds. This would lead to better productivity and more positive patient outcomes, which will save huge costs for the Australian economy and taxpayers.												
DP240103045 Ellis, Prof Kathleen M	**Diversifying audio description in the Australian digital landscape** Audio description (AD) is a track of narration describing important visual elements of visual media to make it accessible to people who are blind or vision impaired. It is also increasingly being used by the mainstream audience. This project aims to examine the consumption and production of Audio Description throughout Australian cultural life. It expects to generate new knowledge about the ways digital media including emerging generative artificial intelligence might be leveraged to increase access to audio description. Expected outcomes include a curriculum, guidelines and materials designed to empower industries, communities and governments to work together to meet Australia's obligation to provide access to cultural activities using AD. **National Interest Test Statement** This project will research the history and present use of, and the future potential for, audio description (AD) in Australia. AD is a verbal translation of visual media allowing access for blind audiences. Australia's implementation of AD to date has been narrow and unambitious in scope, aiming to meet minimum requirements. By mapping the increasingly transformed media landscape through online services and their deployment of AD, this project will illustrate examples of local best practice and situate them within international trends. It will then focus on the current and near-future utility of cutting-edge technologies, including generative AI, to examine the much wider potential for AD in Australian culture. Far from being only for people with vision impairments, this technology has the potential to greatly enhance the way Australians access, understand and enjoy screen and live creative work. The research findings will be	57,573.50	118,354.00	145,317.50	84,537.00	0.00	0.00	405,782.00			United States of America, Spain, England		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	translated via user-friendly resources (reports, podcasts, an AD training course, and guidelines). The research, created with and for AD audiences, will be shared with key industry groups (Amazon, FIFA, SBS) and peak bodies to build a robust roadmap that will ensure Australian screen and creative industries and policy makers have a clear understanding of the scope and potential of AD, and that Australia can meet obligations under the United Nations Convention on the Rights of Persons with disability to provide access to cultural activities using AD.												
DP240103097 Massi, Prof Massimiliano	**Investigating Energy Transfer Pathways in Lanthanoid Elements** This project aims to investigate fundamental aspects concerning the luminescent properties of compounds containing lanthanoid elements. These elements have extensive use in many high-tech applications, yet essential knowledge related to their properties is still quite limited. This project will elucidate in detail the origin of lanthanoid luminescence through a multidisciplinary approach combining synthetic chemistry and spectroscopy. The outcomes of this proposal will expand our limited knowledge in this field, underpinning the future development of novel materials for advanced applications. This will lead to significant economic benefit in Australia as new commercial applications relying on lanthanoid luminescence will be developed.	75,679.00	160,215.50	165,860.50	81,324.00	0.00	0.00	483,079.00			Italy		
	National Interest Test Statement Rare earth elements are critical to current and developing technologies, which ensures that the demand for their global annual production runs to hundreds of thousands of tons. Rare earth elements, for example, form the light-emitting components of smartphones and tablets and the magnetic materials in vehicles, and they play an essential role in advancing greener energy production through their use in wind turbines. Australia has important deposits of rare earth metals, especially in Victoria and Western Australia, which could position us as one of the leading economic beneficiaries of the rare earth industry. This proposal intends to explore the fundamental properties of rare earth elements, to gain a deeper understanding of how they can best be leveraged to advance current technologies; for example in improving the inefficient functioning of erbium-doped fiber amplifiers used in telecommunication signalling. The findings should also contribute to the development of new groundbreaking solutions in fields such as energy and medicine. The project's enhancement of fundamental knowledge in this area will incentivise collaborations between academia and key industry groups, creating opportunities for our partners to adopt the findings and strengthen Australia's position in the global rare earth market.												
	Curtin University	680,364.00	1,518,324.50	1,624,423.50	832,777.00	46,314.00	0.00	4,702,203.00					
Edith Cowan University													
DP240102787 Sun, Prof Hongqi	**Three-dimensional solar-energy-driven hydrogen generation from ammonia** This project aims to address the challenges of hydrogen generation, transportation and storage by conceptualising a novel three-dimensional, solar-driven system for ammonia splitting on ultralight catalyst materials. The project expects to generate new knowledge in the area of advanced materials enabled hydrogen technologies through interdisciplinary approaches involving materials science, novel catalysis, and nanotechnology. Expected outcomes include new catalyst materials, design strategies, and advanced ammonia splitting technologies. This should provide significant benefits, such as newly created	86,063.00	170,817.00	175,738.00	90,984.00	0.00	0.00	523,602.00			United States of America, Germany, Japan		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	knowledge, technological innovation, research training, contributing to hydrogen economy and net zero for a greener environment. **National Interest Test Statement** This project addresses the challenges of hydrogen: its safe storage, cost-effective transportation and clean production, by utilising the concept of Ammonia = Hydrogen 2.0. The high-density hydrogen storage medium, i.e., ammonia, is chosen to develop a clean, innovative, safe and efficient technology for on-site hydrogen production. The storage and transportation of ammonia in place of hydrogen mitigates the demanding conditions and costs to infrastructure and operation. To this end, efficient and stable ultralight nanocatalysts will be developed to enable a novel three-dimensional solar-to-hydrogen platform that produces green hydrogen from ammonia splitting, contributing to zero emissions. This single innovation has the potential to solve the multiple challenges facing the future hydrogen economy. This project can enhance Australia's global competitiveness in ammonia energy utilisation and green hydrogen production and position Australia as a major global player. The research outcomes of this project will be used as the foundation for future scale-up and pilot studies, where commercialisation could be achieved for feasible, cost-effective, safe, and on-site hydrogen production, helping Australia develop a future solar hydrogen economy. This project will also contribute to the Climate Change Bill 2022 and Australia's National Hydrogen Strategy 2019.												
	Edith Cowan University	86,063.00	170,817.00	175,738.00	90,984.00	0.00	0.00	523,602.00					
Murdoch University													
DP240103188 Xu, Dr Wei	**Understanding mosquito smell system: a new frontier in mosquito control** This project aims to identify and functionally investigate mosquito smell receptors, which are critical in detecting volatile compounds and locating their hosts from a considerable distance away. Mosquitoes display preferences for certain hosts over others, primarily determined by volatile chemicals produced by hosts. This study builds on recently discovered, novel, host-derived volatile compounds, which can elicit robust responses and attractiveness from mosquitoes. Expected outcomes of the project are enhanced understanding of mosquito smell system and behaviours. This could provide significant benefits to how we can fight mosquitoes and mosquito-transmitted diseases in a more efficient and environmentally responsible way. **National Interest Test Statement** New evidence of the mosquito smell system from this research will provide important insights and new understanding of how mosquitoes perceive hosts and transmit diseases. The findings have the potential to change how we approach the study of mosquito biology, behaviour, and ecology in future investigations. There are also significant practical applications to how we fight mosquito-borne diseases in a more efficient and environmentally friendly way. This research will also show how multidisciplinary approaches to investigating mosquito chemical ecology, can continue to help us understand mosquito genomics, physiology, behaviour and ecology. This will enable us to better understand how mosquitos transmit other diseases including Dengue, Zika, Ross River and Japanese Encephalitis.	82,644.00	176,579.00	189,695.00	95,760.00	0.00	0.00	544,678.00			United States of America		
	Murdoch University	82,644.00	176,579.00	189,695.00	95,760.00	0.00	0.00	544,678.00					
The University of Western Australia													
DP240100051	**Investigating a novel genetic strategy for insect resistance in crops**	103,924.50	207,799.00	217,234.00	113,359.50	0.00	0.00	642,317.00			India, China (excludes		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
Batley, Prof Jacqueline	Plants are in a constant battle with insect pests and there is an increasing reliance on chemical inputs for control. However there are incoming bans on some pesticides, and new approaches are required for pest management. The aim of this project is to develop a new strategy which exploits the dependence of herbivorous insects on phytosterols. Here, we will apply the latest genomics technologies in plants to produce non-utilizable sterols which will not support insect growth and reproduction, but will still allow the plant to function normally. We will demonstrate this in the important crop canola. Translation of this knowledge will support breeding for crop resilience, leading to durable resistance and more sustainable crop production.										SARs and Taiwan), Germany		
	National Interest Test Statement												
	Rapid advances in genomic technologies are changing our understanding of biology and evolution, with opportunities for agriculture. Globally, pests lead to huge yield loss in crop and food production and cultivated species contain little natural resistance to these pests. These pests are often difficult to control with pesticides. This project will identify and characterise genes that control sterol production in plants. Insects cannot produce their own cholesterol and rely on certain plant sterols for this. Through changing these sterols the plant produces using novel genomic techniques we will study how they affect insect resistance. This information can be used to design a novel strategy for insect resistance to breed insect resistant plants and increase crop yields. The results will be translated for industry through the identification of new resistance genes for major Brassica insects. This can be applied to all crop species in future. The ultimate goal is to ensure that there is enough food to feed the growing population and have an armoury of genes that can be deployed rather than using chemical inputs. This project will accelerate crop breeding, ensuring food security and supporting rural economies.												
DP240100230 Wernberg, Prof Thomas	**Identifying potential trade-offs of adapting to climate change** Climate change and marine heatwaves introduce strong, directional selection for heat tolerance which, in turn, alters the genetic composition and diversity of marine species. While this may facilitate adaptation to warmer conditions, reduced genetic diversity may limit resilience or cause maladaptation to additional stressors. This project will focus on habitat-forming kelps and will aim to both assess the negative consequences of rapid selection and to disentangle the mechanisms of climate adaptation. Through a powerful combination of controlled experiments on known genotypes and cutting-edge transcriptomic approaches, this project will transform our understanding of the adaptability of foundation species in a rapidly changing ocean.	108,290.00	247,357.00	283,254.00	144,187.00	0.00	0.00	783,088.00			Norway, Canada		
	National Interest Test Statement												
	Kelp forests are some of the most ecologically and economically important marine habitats covering approximately 1/3 of the world's coastlines and more than 8,000km of shoreline in Australia alone. Kelp forests are threatened in Australia and globally by climate change and associated marine heatwaves which can drive transitions to less desirable ecosystems with lost ecosystem services estimated at ~$1,000,000 per km of coastline per year. This project will transform our understanding of how heat tolerance is determined, how it evolves and whether there are trade-offs associated with rapid or assisted adaptation to climate warming. This project will position Australia at the frontline of the international efforts to understand and mitigate the impacts of climate change with research aimed at preventing the negative socio-economic impacts of ecosystem collapse. The project is strongly aligned with the Australian government priority area of assessing environmental change.												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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DP240100589 da Cunha, Dr Elisabete	**Galaxy evolution in high definition with the world's largest telescopes** This project aims to determine where, when, and how galaxies formed their stars in the key epoch spanning the first four billion years of the Universe's history. Astronomy has entered a new era with the Atacama Large Millimetre Array (ALMA) and James Webb Space Telescope (JWST), the most powerful telescopes ever built. Together, they provide the sharpest and most complete view of distant, young galaxies ever achieved. This project will use cutting-edge ALMA and JWST observations to produce high-definition maps of the physical parameters of young galaxies through innovative analysis techniques. The project will enhance Australia's standing in astrophysical research, while inspiring the next generation of STEM students and workers.	82,373.00	166,746.00	168,746.00	84,373.00	0.00	0.00	502,238.00			Netherlands, United States of America		
	National Interest Test Statement Understanding how galaxies such as our own Milky Way have formed and evolved over the 13.5 billion years of cosmic history is one of the key goals of modern astrophysics. This is one of the driving forces behind technological innovations and multi-billion dollar international investments to build powerful telescopes such as the James Webb Space Telescope (JWST) and the Atacama Large Millimetre Array (ALMA). Australia is a world-leading astrophysics research nation. The current strategic partnership with the European Southern Observatory (ESO), the leadership in the upcoming Square Kilometre Array, and the rapid development of the space sector, show that it wants to continue to lead this field. This project offers an opportunity for Australia to enhance its scientific standing and space strengths by playing a major role in the scientific discoveries enabled by JWST and ALMA. It will also lay the foundation of a future ALMA science centre in Australia in anticipation of possible full membership in ESO. This project will not only create new knowledge about our Universe, but it will importantly contribute to establishing Australia as a STEM-savvy nation. Astronomy has long been considered a 'gateway' science that captures the public's imagination, so the results will be widely shared with the public. This project will also train students and early career researchers, providing critical thinking and data analysis skills that are now, more than ever, needed in the modern workforce.												
DP240101230 Ecker, Prof Ullrich K	**The Misinformation Future—Confronting Emerging Threats** Misinformation presents challenges to public health and democracy. Though psychological research has explored processing mechanisms and countermeasures, new threats are arising that need to be confronted. This project aims to help meet these threats by (a) investigating misinformation impacts on future-oriented cognition and behaviours, with a focus on global long-term issues and (b) addressing the unique challenges posed by visual and synthetic (AI-generated) misinformation. The expected outcome is new knowledge on the processing and impacts of emerging types of misinformation and translation into practical interventions. These promise to benefit consumers, educators and policymakers, contributing to a healthier information environment.	41,969.00	120,794.50	160,126.00	127,557.00	46,256.50	0.00	496,703.00			England, United States of America		
	National Interest Test Statement Misinformation is presenting challenges to public health, education, and science communication. Through its influence on public debate, it also has adverse impacts for journalism, policymaking, and ultimately democracy—if citizens no longer agree on basic facts, then polarization, conflict, and poor policy outcomes ensue. Thus far, psychological misinformation research has focused largely on self-report measures and textual misinformation, mostly neglecting effects												

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

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		2023-24	2024-25*	2025-26*	2026-27*	2027-28*	2028-29*						
(Columns 1 and 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	on actual behaviours and novel media such as video and text generated by artificial intelligence (AI). This project will use innovative tools to investigate misinformation effects on future-oriented decision-making and behaviour, focusing on long-term global challenges including climate change and pandemics, and the emerging threats of visual and AI-generated misinformation. This will not only improve our understanding of the psychological mechanisms involved, but will deliver tools to reduce misinformation impacts that will be useful for consumers, journalists, and educators. The project will influence debates about legislation and national security, and will inform both policymaking and the development of technological and regulatory solutions. In keeping with the team's public-engagement record and supported by a pathway-to-impact plan, we will disseminate findings widely through open-access publications, publicly available handbooks, our extensive professional networks, and a global and local media presence.												
DP240101389 Lydon, Prof Jane	**Australian Legacies of British Slavery: Capital, Land and Labour** This project aims to bring Australia into the global history of slavery by exploring the legacies of British slavery in South Australia and Victoria. Through developing methods for biographical research and digital mapping, it will trace the movement of capital, people and culture from slave-owning Britain to the new settler colonies, and produce a new history of the continuing impact of slavery wealth in shaping colonial immigration, investment, and law. Expected outcomes of this project include enhanced capacity to build international disciplinary collaborations, new research methods, and research capacity building. Benefits include a radically new perspective on Australian history and abolition in the present, with major public outcomes.	93,590.50	206,083.00	224,838.00	112,345.50	0.00	0.00	636,857.00			England, Scotland		
	National Interest Test Statement The project aims to re-write Australian history by revealing the hidden story of our links to British slavery. We will explore the movement of capital, people and culture from slave-owning Britain to South Australia and Victoria, both colonies founded immediately after abolition (1833) as alternative sites of investment for slavery 'compensation' funds paid to slave-owners. By advancing new research methods of digital mapping, new biographical methods in collaboration with the Australian Dictionary of Biography, archival research and analysis by an international team, it will have considerable benefit in research training and development and increase Australia's capacity to build international disciplinary collaborations. The project will have major cultural benefits in leading public conversation regarding 'Difficult Histories'. It will provide context for current global campaigns against human trafficking involving Australia as a destination and in commercial supply chains. The project will communicate this new history to a broad mainstream audience via major public outcomes in partnership with leading heritage organisations, the National Trust of Australia (Victoria) and the History Trust of South Australia. Through interpretive and educational programs, and public events, delivered collaboratively with the NTV and HTSA, we will translate and share findings with a very wide audience.												
DP240101808 Gaudin, Prof Christophe	**Unlocking new generation physical modelling with realistic soil response** This project will improve the safety and efficiency of geo-structures associated with offshore wind developments by better characterising and replicating the behaviour of carbonate sediments. Novel characterisation techniques will be used to better understand the links between the chemical and structural composition of the sediments and their engineering properties relevant to geotechnical design, and how to better replicate carbonate sediment behaviour in a laboratory – an outcome that has eluded researchers for decades. The main outcomes of the project will be the development of soil sample reconstitution techniques enabling high-fidelity physical modelling to be	82,837.00	194,052.00	222,081.50	110,866.50	0.00	0.00	609,837.00			United States of America		

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	undertaken to assist in the design offshore wind turbine foundations. **National Interest Test Statement** Australia has a legislated target of net zero CO2 emissions by 2050 and will invest heavily in offshore wind to achieve this. Rapid growth in this sector mirrors earlier expansion of the oil & gas sector, and will bring similar benefit to the nation. The majority of offshore wind turbines will be founded in (carbonate) seabeds – which have behaviour that is notoriously difficult to predict, and plagued early offshore projects with expensive foundation failures. The wind sector cannot afford such a learning curve. This project will avoid this by (i) developing techniques to replicate the behaviour of carbonate soil; and (ii) demonstrating these approaches will facilitate new generation of model testing to underpins the safe and reliable design of foundation for wind turbines for Australian conditions.												
DP240101926 Mian, Prof Ajmal S	**3D Diffusion Models for Generating and Understanding 3D Scenes** Diffusion models, such as DALL-E2 and Imagen, have achieved remarkable success in generating photorealistic images and hold promise to solve long-standing computer vision problems. However, 3D scene generation remains unexplored. This research project aims to bridge the gap by developing 3D diffusion models capable of generating complete 3D scenes. This will advance our theoretical understanding of diffusion in complex 3D environments and open up new possibilities for applications in fields such as virtual reality, architecture, and city planning. The proposed 3D diffusion models will also enhance the accuracy of computer vision tasks related to 3D scene understanding, such as object detection, tracking, and semantic segmentation. **National Interest Test Statement** This primary goal of this project is to tackle practical research challenges in transport and advanced manufacturing, in line with Australia's research piorities. The project aims to improve logistics, urban design, autonomous systems, sensor technologies, real time data and spatial analysis. The outcomes of this project will benefit various application areas, such as virtual and augmented reality, which can use the project's outcomes to create 3D scenes for training and educational purposes, as well as for architectural design, both for interior building design and outdoor urban areas. This can aid in designing buildings, living spaces, and in city planning. Diffusion models can potentially improve the performance of computer vision tasks related to 3D scene understanding such as object detection, classification, tracking and semantic segmentation, which are crucial for autonomous systems that rely on vision. Outcomes of this project will essentially equip such systems with reliable vision, enabling them to make intelligent decisions such as navigation, precise object detection, localization and pose estimation for interaction with various objects. Overall, this project has significant implications for Australia's competitiveness in the ongoing race for Artificial Intelligence leadership among advanced nations, as it seeks to push the boundaries of 3D scene generation and understanding through diffusion probabilistic modeling.	80,000.00	163,500.00	170,500.00	87,000.00	0.00	0.00	501,000.00			United States of America		
DP240102441 Waters, Dr Mark T	**Control of crop-microbe symbiosis by new plant hormones** This project aims to discover how plants use hormone-like chemicals, called butenolides, to control symbiotic relationships with soil fungi. It will use multidisciplinary and collaborative techniques to establish how butenolide metabolism affects the diversity of fungal colonisation. Expected outcomes of this project include a deeper understanding of how plants regulate the competency of roots to host symbiotic fungi, and how this affects plant growth. As such, it will generate knowledge of how cereals	93,688.00	178,438.00	166,500.00	81,750.00	0.00	0.00	520,376.00			Germany		

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

Minister's Approval for Discovery Projects for Funding Commencing in 2024 Schedule

Approved Organisation, Leader of Approved Research Program	Approved Research Program	Estimated and Approved Expenditure ($)	Indicative Funding ($)					Total ($)	Strategic Research Priority Area	Industrial Transformation Priorities	International Collaboration	Partner Organisation(s)	Industry Partner(s)
(Columns 1 and 2)	(Column 3)	2023-24 (Column 4)	2024-25* (Column 5)	2025-26* (Column 6)	2026-27* (Column 7)	2027-28* (Column 8)	2028-29* (Column 9)	(Column 10)	(Column 11)	(Column 12)	(Column 13)	(Column 14)	(Column 15)
	such as barley could be modified to improve their nutrient use efficiency. Benefits of this project include the potential to reduce fertiliser inputs, thereby improving the competitiveness and environmental impact of Australian agriculture.												
	National Interest Test Statement												
	Australian soils are often low in nutrients like phosphate, so farmers use non-renewable chemical fertilisers to add more. However, many crops are able to form a natural partnership with fungi that help the plant collect phosphate, so less fertiliser is required. This project seeks to understand how the partnership operates in barley, Australia's second most valuable cereal crop. We have identified a chemical signalling system in plants that allows the fungus to access the plant roots, but we don't know how this system operates. We also don't understand whether the signalling system works with different kinds of fungi, or how modifying it will affect plant growth and performance. This research will generate knowledge that could have the benefit of reducing the use of chemical fertilisers and water. This will improve the environmental footprint and reliability of Australia's food supply, and strengthen our agricultural sector. End-users of this research would include farmers and land managers, but also manufacturers of soil additives for different kinds of land use.												
DP240103385 Lister, Prof Ryan	**Advancing plant synthetic gene circuit capability, robustness, and use** This project aims to advance our ability to control gene expression in plants using synthetic gene circuits. By expanding the toolkit and optimizing circuit components, we aim to achieve more complex capabilities and robust implementation. Furthermore, we will apply gene circuit technologies to enhance plant frost tolerance. The expected project outcomes include a significant advance in gene circuit capabilities, a better understanding of their behavior in plant cells, and the ability to use them to confer advantageous traits. The benefits of this research include new plant biotechnology tools that will underpin future crop yield improvements, and advances in plant-based pharmaceuticals and materials.	94,438.00	206,376.00	218,876.00	106,938.00	0.00	0.00	626,628.00					
	National Interest Test Statement												
	Modern plant biotechnology relies heavily on controlling gene activity to change plant functions and confer valuable agronomic traits. However, our ability to precisely manipulate gene activity to engineer plant form and function remains rudimentary, precluding the advanced manipulation to improve crop yields and resilience. We aim to solve this problem by significantly extending our recent successful demonstration of gene circuit technologies in plants, with sights set on applying these tools to improve stress tolerance in an increasingly unstable climate. This research will strengthen Australia's investment in synthetic biology, which is poised to transform existing agricultural industries and provide new opportunities for Australian food production. It will further establish Australia as an international hub for plant synthetic biology, spurring a burgeoning national biotech industry and accelerating production of next-generation crops with new traits and improved tolerance to extreme environmental conditions. To promote our research achievements beyond academia, we will continue to engage with media and students spanning the education spectrum to broaden public understanding of our research and engage in ongoing dialogue regarding its implications. We will directly engage with industry, and build new collaborative links with government and primary industry research bodies to develop enhanced plant varieties and promote translation and industry adoption of our research.												
	The University of Western Australia	781,110.00	1,691,145.50	1,832,155.50	968,376.50	46,256.50	0.00	5,319,044.00					
	Western Australia	1,630,181.00	3,556,866.00	3,822,012.00	1,987,897.50	92,570.50	0.00	11,089,527.00					
		35,345,224.50	**73,203,238.50**	**72,346,885.00**	**36,571,525.00**	**2,399,111.00**	**316,457.00**	**220,182,441.00**					

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